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NOVEMBER 1996
PHYSICAL SCIENCE :

**Factors contributing to pupils' performance
as perceived by various role players**

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ABSTRACT

This research employed mainly qualitative analysis to investigate the factors that affected the Physical Science results of 18 pupils chosen from three schools from the surrounding area of Durban. The case studies were mainly investigated through carefully planned interviews with teachers, pupils and examiners to ascertain their perceptions regarding possible influences on the results of pupils. The results obtained mainly were geared towards teacher qualifications; resources; disruptions; examinations; parental involvement and pupil performance. Some of the factors that influenced pupils performance positively, were : attentiveness in class; ability to debate, argue and question; provide unusual solutions; exposure to tutor; parental involvement; and peer learning, whilst negative influences were: poor grasp of concepts; emotional and psychological problems; declining school interest; biased towards other subjects; rescheduling of papers; and rushed teaching.

The analysis of the question papers in Physical Science revealed that the large number of multiple choice questions, based on higher level reasoning took up a large proportion of pupils answering time; the language and general layout of the question papers needs to be replanned to cater for easy reading as well as to be understood by the majority of pupils; and the time allocation for the papers need to be re-adjusted.

Findings of this research will be of interest to all classroom practitioners that are concerned about improving pupils performance, especially at the matric level, as well as pupils writing their matric and examiners setting such papers.

DEDICATION

This research is dedicated to the three people whom I love most in my life, viz., my wife, Sharlene; daughter Serisha; and son Ryan. All three have played significant roles in the culmination of this research. Sharlene was my inspiration and driving force behind this research. Serisha, being only four years old, offered support by keeping her younger brother busy while I was working on this research. Ryan, on the other hand, was the one who lost out most from me, and therefore deserves most of this dedication, as he was barely 3 months old when I embarked on this study. Ever since, he has hardly had my full attention, therefore this research will always remind me of him.

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Finally, I would like to thank Sharlene, Serisha and Ryan, my immediate family members, whose love, support and sacrifice made this research possible.

DECLARATION

I, HEERAMAN SOOKRAJ, declare that this dissertation is my own work, and has not been submitted previously for any degree in any university.



RESEARCHER



SUPERVISOR

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CHAPTER ONE : DEFINING THE PROBLEM

1.1. INTRODUCTION

"Most of KwaZulu-Natal's science and mathematics teachers are seriously under qualified, an Education Foundation report has revealed.

While 71 % of math(ematics) teachers and 69 % of science teachers in the province had the necessary professional teaching qualifications, 72 % and 81 % respectively had not received sufficient tuition to specialise in the two subjects, the report indicated.

The national survey discovered that schools and colleges were **seriously under-resourced with too few teachers and lecturers, and seldom, if ever, laboratory assistants.**

In addition, laboratory equipment, textbooks and libraries were inadequate. An annual shortfall of more than 3 000 math(ematics) teachers (50%) and 3 600 (60%) science teachers is expected over the next three years. During the matric examinations of 1996, more females (42 %) failed than their male counterparts (34 %), but achieved similar (22 % - 24 %) university exemption rates. The enrolment figures for the province's three technikons showed between 8 % and 26 % more males were accepted in 1996 with an equal gender balance for enrolments at both UDW and the University of Natal." (The Natal Mercury, 14 July 1997).

Add to this, an article from the Sunday Tribune, 10 August 1997,

... "The School Register of Needs Survey, released by the national department of education, tells a horrifying tale of deprivation, neglect and waste that explains many of South Africa's problems. For associated with bad education is a weak economy, crime, poor health and a host of other societal ills.

One in four of the country's 27 869 schools has no water, more than half have no power, two in three have no flush toilets, and less than half have adequate textbooks. There is a shortage of 57 499 classrooms, more than a million children need a desk and chair, and more than 100 000 teachers have no chairs.

The most disadvantaged provinces - the Eastern Cape, Northern Province and KwaZulu-Natal - have nearly seven million of the country's just over 12 million pupils, and incorporate most of the former homeland education departments."

These two articles mainly, illustrate the one inheritance that the country as a whole, gained from the apartheid era in South Africa. More especially, since these two

articles refer to KwaZulu-Natal(KZN), we see the inequities of the past having a detrimental effect on the province's education, which have a spiralling effect on crime, poverty, health, etc. As part of the immediate redress in KZN, urgent attention needs to be paid to the high number of unqualified teachers and poor state of resources at schools, as they do have a bearing on performance of pupils in a common examination. Thus my research topic attempts to examine some of the multitude of factors that influence pupils' performance.

1.2. Statement of Purpose

This research is a **qualitative investigation into what factors have affected std. 10 (grade 12) Physical Science results of three schools in the greater Durban area.**

Definition : the std. 10 results referred to in the statement of purpose, were the final symbols obtained by matriculants in the external examination for KZN during November 1996. This necessitated the formulation of two critical questions, viz.

- a. **What perceptions do different players, i.e. pupils, teachers, examiners and sub-examiners, have of the results of pupils for the 1996 Physical Science examinations?**
- b. **What does the analysis of pupils' results and question paper reflect about the performance of pupils in Physical Science for the 1996 examinations?**

The critical questions required an in depth analysis through different perspectives, viz. the pupil, the teacher, the examiner, the question paper and the results themselves.

1.3. Rationale for this study

As a Physical Science teacher, I firmly believe that a teacher and learner are not the only contributors towards success in the school environment, especially with regards to results obtained by matriculants. There are numerous factors which have a direct

or indirect influence on academic achievement of pupils. This research aims at finding out how these factors influence pupil achievement, and then examine how these factors could assist in improved academic performance.

Some of the newspaper headlines that prompted me to get more involved in this study, were:

"Pupils all set for matric" - (Daily News, 10 October 1996). Here the reporter stated that despite chalkdowns and boycotts at several KZN schools, principals were adamant that their staff had done their best to prepare matric pupils for the 1996 examinations. About a month later, the next headline left nothing for the imagination - **"Turmoil as matric examination is cancelled - Physical Science paper leaked and sold."** - (Daily News, 8 November 1996). The article reported that the KZN's 1996 matric examinations were in shambles after the cancellation of the Physical Science examination, after the paper had been leaked, copied and sold. A third article titled **"Matric examination shock - 22 papers now rescheduled."** - (Saturday Paper, 9 November 1996), interviewed two pupils that had the following to say.

Sastri College head boy ... "my biggest fear is the results will be released late and that will jeopardise my entry into university."

Durban Girls High head girl ... "I am very frustrated because I have put in many hours of studying. I hope they do something to the people who did this" (leaked papers).

Having now had the hindsight of what occurred in the 1996 examinations, especially with regards to Physical Science, viz. leaked papers as well as the high failure rate (more than 60% failed) in Physical Science and the sudden increase over the past few years in pupils seeking extra tuition, has given me enough to want to find out more about what factors were responsible for the high failure rate. For this, I have only chosen three schools within a 20 km radius of Durban, KZN. The findings of this research would be useful to educators and pupils directly involved in the teaching and learning of Physical Science. In addition, the findings would be useful to examiners

setting the std. 10 examination papers in Physical Science in KZN. It is hoped that Physical Science curriculum developers would also welcome initiatives and suggestions that this research would have to offer. For the first time in 1996, all pupils, irrespective of race, would be sitting for the first common examination, and as this was going to be a historic moment for all pupils that wrote matric in KZN, the results of this research would provide an ideal study to spark off other similar studies in determining how far the equity initiatives have materialised in this Province.

1.4. Preview of other chapters

The next chapters give attention to the following:

Chapter two - will provide an historical perspective in which the research finds itself, followed by a review of literature, identifying factors and their influence on academic achievement.

Chapter three - outlines the research methodology used; planning for data capture in terms of choice of schools, initial school contact, contacting pupils and interviewing of teachers; discussion of research technique and instrument used for each critical question; and a roundup on validity and reliability.

Chapter four - deals with presentation of research data and its analysis in terms of the critical questions.

Chapter five - finally collates the strands of the research; mentioning some research limitations; recommendations and conclusions.

CHAPTER TWO : LITERATURE REVIEW

2.1. HISTORICAL PERSPECTIVE

Since 1948, the Nationalist Government ruled in South Africa and their apartheid policy was firmly entrenched. Subsequently, the international community applied sanctions, which effectively isolated South Africa from most of the world. Thus South Africa was forced to develop its own technological capabilities (Mc.G.Tegart 1994:5). Numerous factors, including internal resistance to apartheid, the Soweto uprising, (Kahn, Volmink, Mhlongo & Naidoo 1995:2), the downturn in the economy, etc. led to the collapsing of the apartheid regime which was announced in 1990 by the then President of South Africa, F.W. De Klerk.

In April 1994, South Africa's first democratic election gave birth to a new Government of National Unity (GNU). Shortly after its establishment, the GNU formulated its vision for society in a Reconstruction and Development Programme (RDP). This sought to significantly increase the rate of economic growth, invest in human and physical capital, address basic needs and consolidate democracy (Hofmeyer & Hall 1996:22).

The implications of the new order and vision for education, one of the key battlegrounds of the apartheid regime, were immense. Fundamental change was required to bring about an equitable, democratic, and inclusive education and training system for effective human resources development, within the increasingly competitive international context.

The present South African Constitution provides for concurrent powers on education, shared by the national and provincial departments. The nine new provinces are responsible for the schools and colleges of education. Accordingly, the 19 apartheid departments of education were re-organised into one national and nine provincial departments. In practice, this has involved a mammoth task of uniting separate ethnic

and regional departments in each province. In KZN, the education department incorporated mainly the infrastructure of the ex-House Of Delegates (H.O.D) department as it was deemed to be the most efficient in the province. The new department of education inherited several legacies of apartheid which are explained in the following paragraphs.

According to Makhurane (1995), for most African countries - including South Africa, much energy went into internal squabbles and struggles instead of into the evolution of those qualities that constituted human development. Meagre economic resources have been devoted to the acquisition of expensive armaments and the training of large armies instead of the development of education. It cannot be denied that in the past and at present, the teaching of science in our secondary schools has been constrained by the following factors:

- lack of funding for the purchase of chemicals
- lack of laboratories and science equipment
- lack of a science culture among both staff and students
- non-availability of practical scientific experiments in the school resulting in ineffective demonstrations invariably by unqualified teachers (Makhurane 1995).

In the process of trying to catch up with the developed parts of the world, South Africa has tended to take some short-cuts. South Africa now has many instances where teachers have the same basic education as the children they teach (Makhurane 1995). Lewin (1995:23) contends that there is a general over-capacity to train teachers and yet there is a shortage of science teachers. This situation has been exacerbated by a qualification system that allowed diploma teachers to up-grade to degree status. Thus, according to Kahn (1993:27), science teachers may have upgraded themselves by taking Criminology and Biblical Studies, for example, neither of which contributed to the ability to teach science. Kahn also concluded that low student attainment in Science and Mathematics was to a large extent, a product of poor teaching. Since many students did not obtain a senior certificate pass in Science and Mathematics, few qualified to train as science teachers. Science and Mathematics have thus been avoided by teacher trainees, and the system remained incapable of meeting the need

for more and better qualified Science and Mathematics teachers. There is a self-consistent loop of mediocrity in operation according to Lewin (1995:19).

Further neglect of practical work in Physical Science was due to the fact that many science teachers have graduated through UNISA via correspondence (Lewin 1995:19). Those that have followed this path have had few opportunities to develop practical skills. In the sciences, because the senior certificate examiners (especially ex-DET) paid scant attention to practical work, teachers did not waste time on practical work when the material was not examinable (Kahn 1993:28). A good science teacher was perceived by pupils, as one who could "spot" the probable examination questions and drill students accordingly.

Figures for Black matriculants for 1990 with Mathematics and Science passes were shown to be exceptionally low, indicating that most Black pupils were inadequately prepared for entry to technikon or university study in the science, engineering and technology (SET) fields (Associated Scientific and Technical Societies (AS & TS) 1993:14). In addition, few of these students have achieved fluency in English. They have been further exposed to under-trained teachers, inappropriate textbooks and the culture of rote learning (Macdonald cited in Kahn 1993:26). This was also confirmed by Bawa (1993:3), who indicated that in 1990, only 8% of African students obtained exemption passes and a fraction of this number did Mathematics and Science. Bawa stated that this contributed to the failure of secondary science and technology education. Further contributory factors to this failure have been that the Science curricula were determined by university requirements and that there has been no technology component. Also, the nature of learning/teaching at school level, in the absence of proper and sufficient teacher education, became heavily dependent on rote-learning and other forms of "banking" (Bawa 1993:4 and Lewin 1995:26).

In South Africa, pass rates at the end of Std 10 were below 40% in the ex-Black school system, around 80% in ex-Coloured schools, and over 90% in ex-White and ex-Indian schools, during the apartheid era (Lewin 1995:9), resulting in an average pass rate of about 75% (my estimation). Of those who enrolled in Std 8, in KZN,

only one in eight students passed physical science in matric. This could have been due to the fact that the matric examination served a dual role, one as school leaving certificate, and the other as matriculation exemption mechanism (for university entrance), as stated by Kahn (1993:28).

Schools have been opened to all races since 1994, thus the demographic composition of pupils at most schools has changed. Previously disadvantaged pupils have now been afforded the opportunity to pursue their schooling at so-called "advantaged" schools -as a result, exclusively "White" or "Indian" schools hardly exist in KZN. Although these changes have taken place, the factors related to academic performance have remained the same. For purposes of establishing a broader conceptual framework and discussion I have categorised these factors into the following:

socio-economic and political factors; parental factors; teacher factors; pupil factors; school-related factors; examination-related factors; and policy and planning issues.

These would be reviewed in terms of what the different factors are that affect academic achievement and how they influence it.

2.2. FACTORS INFLUENCING ACADEMIC ACHIEVEMENT

2.2.1. SOCIO-ECONOMIC AND POLITICAL FACTORS.

Table 1 on page 10 contains a summary of socio-economic and political factors that influence academic performance, subdivided into first and third world research. The factors listed have a bias towards third world or developing countries suggesting that socio-economic and political factors are more likely to influence academic performance significantly in third world rather than first world countries.

A quotation by Bowles (1968), from an American perspective summarises appropriately :

"...given the importance of student attitudes and social-class background in the learning process, it may well be that no feasible program(me) of compensatory education could overcome the educational disabilities imposed upon Negro children by racial discrimination and, in addition, upon poor Negro children by their lower class origins. Closing the achievement gap may require changing student attitudes towards schooling and towards themselves; this can hardly be accomplished except through, or at least in conjunction with, an all-out social assault on racism and on the poverty and the powerlessness of the poor."

The above quotation illustrates that when American Negroes were faced with racial discrimination and poverty, it led to them developing a poor attitude towards education in general and towards themselves. This has been responsible to some extent for their poor performance. This is very apt when analysing the situation regarding non-White education in South Africa before the transformation process was proposed for educational reform. Local research done by Mashile and Mellet (1996) in the East Rand, Gauteng, revealed that pupils' attitudes towards school were also related to the political, social and economic conditions. Hamilton (1982) researched Jamaican students' attitudes to science and relationship to achievement in external examinations. She concluded that a better attitude was certainly associated with higher marks because the attitude conditions other factors (home environment; teacher influences) which determines students' achievement level. I agree with Bowles and Mashile and Mellet, in the sense that these pupils' attitudes were deeply rooted in social, economic and political problems, and that change in pupils' attitude cannot be simply achieved, unless changes in the social, economic and political spheres occurred. The transformation process in South African education, has taken a step in exactly this direction, and hopefully an improvement in pupil attitude will occur in the long term.

TABLE 1 : SOCIO-ECONOMIC-POLITICAL FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
student attitude	Bowles(1968)	Hamilton(1982)Mashile & Mellet(1996)
social class background	Bowles(1968);Dyer(1968); Adams(1993); Güncer & Köse(1992); Jensen(1983); Teachman(1996); Voelkl(1993)	Tshazibana(1996); Rollnick & Reddy(1995); Booth(1996); Heyneman & Loxley(1982)
racial discrimination	Coleman(1968); Bowles(1968)	Rollnick & Reddy(1995)
political & social instability	-----	Mashile & Mellet(1996)
poor school attendance	-----	Mashile & Mellet(1996)
dropout due to pregnancy	-----	Mashile & Mellet(1996)
drug abuse	-----	Mashile & Mellet(1996)
gang formation	-----	Mashile & Mellet(1996)
location of schools	-----	Fuller(1987); Rollnick & Reddy(1995)
age	O'Brien(1994)	-----
disrupted schooling	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
unpopularity of Physical Science	-----	Kahn et al(1995)
academic bias	-----	Kahn et al(1995)
gender disparities	Hickman et al(1995); O'Brien(1994); Adams(1993)	Rollnick & Reddy(1995); Booth(1996); Naidoo & Lewin(1996); Naidoo & Khumalo(1996); Hamilton(1982); Kahn et al(1995); The Natal Mercury(14/7/97)
loss of teaching time	-----	Daily News(10/10/96)
culture of teaching & learning	-----	Sunday Tribune(5/1/97)
school management	-----	Sunday Tribune(5/1/97)
choice of grades	-----	Sunday Tribune(5/1/97)
administration of education	-----	Sunday Tribune(5/1/97)

According to Mashile and Mellet (1996), poor performance was due to

unsustained school attendance; dropping out due to pregnancy; drug abuse; gang formation; and breaking and burning of schools. These are directly related to the pupils' attitudes and their deep seated causes, viz. political and social instability in South Africa during the apartheid era. The effect of racial discrimination on academic achievement has been well documented in first and third world countries. All of Coleman(1968), Bowles(1968) and Rollnick and Reddy(1995), have indicated that racial discrimination has been responsible for inequity in education.

The effect of social class background has very little influence on academic achievement as stated by authors in Table 1 in first world countries. Socio-economic status(SES) has significantly had an effect on achievement in third world countries. The majority of South Africans have a very poor SES and therefore cannot afford to educate their children, as it is not free. Many children of school-going age are working or walking the streets or involved in crime. Those pupils of very low SES, and mainly from the rural areas have not achieved similar results as their urban counterparts. This is clearly illustrated in the discussion on examination results for KZN as well as supported by Fuller (1987) and Rollnick and Reddy (1995). On a positive note, Tshazibana (1996:102) in his M.Ed. dissertation concluded that despite low socio-economic backgrounds, schools in the Eastern Cape were successful due to the contributions made by the general school community, viz. principals, teachers, pupils and parents.

The Government Performance Monitor (GPM), (1997:14), criticised the ANC Government by claiming that

"the handling of the transformation process in education by ANC office bearers at all levels, and specifically in the provinces, does not instil confidence. Incompetence, ineffective management and hasty decision making have become the rule rather than the exception and this is costing the entire education system dearly."

My criticism of the above would be that being a report by the Nationalist

Party, who were responsible for Education in South Africa before April 1994, how could the ANC repair the damage caused by apartheid practices over the last 40 years, in a span of two years ? The Nationalist Government tried for 45 years and failed but were expecting the ANC to magically resolve things in a space of two years. Further, two of the provinces in South Africa were not under the direct leadership of the ANC, viz. Western Cape(N.P) and KwaZulu-Natal(I.F.P), but were also inefficient. The GPM (1997:17), further indicated that political interference into education by politicians, rather than educationists, have, for example, through

"the pre-mature enforcement of the new teacher - learner ratios can have negative effect on education. Schools will, for example, be forced to offer fewer subjects. The ANC policy of equality at the expense of the capable teacher by offering voluntary severance packages (VSP) - creating a brain drain. The Minister claims that the aim of VSP was not to cause an uncontrolled brain drain, but to facilitate redeployment."

However, in the KZN province for 1997, this did occur, plunging many schools into chaos since May 1997, as replacement teachers were not employed immediately. Re-organisation and re-allocation of staff within schools only took effect as late as mid June by which time pupils were well into a holiday mood, disrupting the culture of teaching and learning, despite an appeal made by the Minister of Education for KZN, Dr. Vincent Zulu, that

...

"There needs to be a concerted effort to improve the culture of teaching and learning in schools. That task falls to politicians, teacher unions, educators, parents and pupils."

Sunday Tribune(5 January 1997).

Hickman et al (1995); O'Brien (1994) and Adams (1993) have pointed out that, in first world countries, more boys chose science and were successful in it. However, Booth (1996) argues that in third world countries, girls achieve better science results since they are self-motivated to do well and forge ahead with their careers as the family's SES demands that its members become financially active as soon as possible. Statistics provided by The Natal

Mercury (14 July 1997) shows that in fact more girls failed despite being the larger proportion of pupils that wrote the 1996 KZN examinations.

O'Brien (1994) indicated that in his research in a first world country, pupils who were older than 18 years of age, achieved lowly academically. Such generalisations cannot be conclusively drawn in third world South Africa as many pupils leave school at some point to join the labour market and sometimes re-enter the schooling arena a few years later. This could also contribute towards disrupted schooling. However, internal political struggles do account for a lot of pupils missing out on school for prolonged periods (Naidoo & Lewin (1996:3); Naidoo & Khumalo (1996:5)), as well as strikes and stayaways by parents which are related to demands for a decent living wage.

Due to the past political scenario in South Africa, where different race groups wrote separate examinations, the mindset of people involved in the examination process, were such that they only functioned in their own paradigms. The quote below, clearly illustrates the point :

"White and Indian teachers were overwhelmed by the sheer numbers and the amount of work to get through. ... Many African teachers failed to cope with the sophistication of White and Indian matriculants, mostly because of language problems" -- anonymous

White marker, 1996 KZN examinations. (Sunday Tribune, 5 January 1997)

The same marker made the point that people of other race groups only opted to mark for the money, but hardly did much work. Knowing that marking scripts on a provincial level would be an overwhelming task, for minority race groups, I cannot understand why the marker was surprised.

The school is an integral institution of society and although attempts may be made to eradicate inequities of the past through a reconstruction and

development programme, we still have to contend with poor school attendance and a general lack of interest in school. In the urban and suburban areas, there is an astonishing crime rate that seems to be uncontrolled; and there are many pupils absconding to attend half-price movies on offer or to attend matinee sessions held at night clubs. These activities seem to be encouraged or at least condoned by parents. The academic performance of pupils cannot be fully appreciated without considering their social, economic and political context eg. the social, political and economic instability in KZN would certainly impact on academic performance.

To summarise, the factors that could have a **positive influence** on performance of pupils in **third world** countries are : a positive attitude towards school; social, political and economic stability; good school attendance; uninterrupted schooling; positive culture of teaching and learning; effective school management and administration.

2.2.2. PARENTAL FACTORS

The influence of socio-economic status on achievement stems directly from status of parents in a community. Thus a discussion of parental factors would be useful in arriving at more specific factors which appear in Table 2 on page 15. Three of the factors, viz. social class background, gender disparities and choice of grades have already been covered in 2.2.1.

According to Hickman, et al (1995), home-based type of parental involvement was related to achievement only in First World countries. This was also the case with Sui-Chu and Willms (1996) who claimed that involvement at home, particularly in discussing school activities and helping children plan their programs, had the strongest relationship to academic achievement. The types of parental involvement that make an impact are homework supervision, school visits and communication with teachers (Shumow, et al 1996).

TABLE 2 : PARENTAL FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
social class background	as per socio-economic-political	as per socio-economic-political
gender disparities	as per socio-economic-political	as per socio-economic-political
parental involvement	Hickman et al(1995); Sui-Chu et al(1996); Shumow et al(1996); Voelkl(1993)	-----
choice of schools	Shumow et al(1996)	-----
availability of parent(s)	-----	Booth(1996)
parental co-operation	-----	Sunday Times(5/1/97)
choice of grades	as per socio-economic-political	as per socio-economic-political

Female students and students in grade 9 and 10 were found to have parents who were more involved, and parents of average and low achieving students did not show much interest (Hickman, et al 1995). Third world pieces of research on parental involvement, that were analysed, were by Güncer and Köse (1992) in Turkey ; and Booth (1996) in Swaziland. Güncer and Köse were able to conclude that most of the variance in pupil achievement was largely related to out of school factors, especially parental factors. Booth added that parental availability affected progress of pupils, i.e. when a parent was away from home for a long period of time, the child's performance declined. Girls did not seem to be affected, as they were well motivated in terms of wanting to be successful. Boys, on the other hand, were traumatised when their fathers were away, thus performing poorly.

Shumow, et al (1996) also considered school choice as a contributor to achievement. They claim that families avoid schools they perceive to be of low quality and parents select schools with resources matching individual children's needs. Unfortunately, in South Africa, a small proportion of parents have their children enrolled at ex-Model C schools, i.e. schools that are partially subsidised by the state (now regarded as state schools), due to their SES, whilst the majority of pupils attend ordinary schools due to no real

choice of their own. Even this will slowly be out of reach of the majority of parents if the Government enforces its decision not to provide financial support to schools, as parents will be forced into choosing schools that demand low fees, or to keep their children out of school. Where certain schools are very poorly resourced, eg. Emshekantambo in Pimville, Soweto, a 53% percent pass rate was obtained in the 1996 examinations in Gauteng, even though the school has no building, occupying premises at three other schools (Sunday Times, 5 January 1997). According to Mary Metcalfe, Gauteng's MEC for education, factors which contributed to the exceptional success of this school included high levels of co-operation between parents, principals, teachers and students.

Positive parent-related factors that impact on academic achievement in **third world** countries are likely to be : availability of parent (father), in the case of boys; healthy SES of parents; and high levels of parental co-operation.

In my research, I will be examining the nature and extent of parental involvement during the interview of pupils. This, I feel was what was lacking in the studies cited, i.e. most data were merely extracted from responses to questions without any in-depth probing.

2.2.3. TEACHER FACTORS

The teacher plays a significant role in the academic achievement of pupils. Teacher factors that have been found during review of literature appear in Table 3 on page 17.

Less than 10% of black teachers in South Africa have university degrees and there is a massive underqualification of teachers in Mathematics and Science in schools serving disadvantaged communities (AS & TS (1993:16)). Where there is a lack of qualified science teachers, Custer (1985) believes that any good teacher can be trained by providing the necessary skills to teach science.

KZN newspaper reports pinpoint the lack of qualified science

TABLE 3 : TEACHER FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
inadequate teachers	Custer(1985)	GPM(1997); Lewin(1992); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
unqualified teachers	Coleman(1968); Saha(1983); Czerniak & Chiarelott(1990); Boylan(1993); Jensen(1983)	GPM(1997); Makhurane(1995); Fabiano(1995); Fuller(1985); Rollnick & Reddy(1995); AS & TS(1993); Kahn et al(1995); Lewin(1992); Naidoo & Lewin(1996); Naidoo & Khumalo(1996); The Natal Mercury(14/7/97)
unmotivated teachers	----	GPM(1997)
VSP and "brain-drain"	----	GPM(1997)
teaching practice	Adams(1993)	Fuller(1987); Crossley(1977); Naidoo & Lewin(1996); Naidoo & Khumalo(1996); Kahn et al(1995)
teacher demographics and background	Saha(1983)	----
teachers attitude	Saha(1983); Czerniak & Chiarelott(1990); Gudmundsdottir(1990)	----
training of science teachers	Custer(1985); Czerniak & Chiarelott(1990)	----
role of the science teacher	----	Rajput(1990)
teacher perceptions	Reck et al(1993); Adams(1993)	----
experience of markers	----	Daily News(10/10/96); Sunday Tribune(5/1/97)
culture of teaching and learning	as per socio-economic-political	as per socio-economic-political
coping with language problems	----	Sunday Tribune(5/1/97)

teachers, as the contributory factor for poor performance in science especially for the 1996 examinations. This conflicts with the survey conducted by Naidoo & Khumalo (1996:9) which revealed that although 90% of teachers are trained to teach Physical Science, very few were university trained, therefore

accounting for poorly trained teachers as many colleges are poorly resourced themselves. In addition, some qualified science teachers were holding administrative posts or teaching other subjects besides Physical Science. Czerniak and Chiarelott (1990) also concede that the teachers' lack of knowledge, and the poor preparation of science teachers, are contributors to poor achievement of pupils. In general, the more rigorous and multivariate studies supported the notion that the better trained teachers produced better results (Saha 1983). It is not the qualifications that a teacher has that influences performance, rather it is the training (necessary skills to teach Physical Science) that makes a significant difference (The Natal Mercury, 14 July 1997).

According to Naidoo & Lewin (1996:17), data pertaining to KZN for 1994, did in fact reveal an excess of qualified Physical Science teachers. However, some were absorbed into teaching mathematics (another claimed area of shortage), and others were in administrative posts with reduced teaching loads, thus accounting for the shortage of qualified Physical Science teachers, and even fewer suitably trained teachers. The GPM (1997:15) claimed that the poor performance of pupils in science was due to inadequate, unqualified and unmotivated teachers. Inadequate teachers could be due to reasons outlined above, as well as the poor status attached to science teaching as other scientific careers appear more rewarding financially. Teachers may be underqualified due to socio-economic circumstances (distance away from places of study or high cost factor). The lack of laboratory assistants, forced science teachers to carry heavier work loads, much to their frustration, resulting in demotivated teachers. The subsequent frustration of several teachers opting for VSP's have further created a hole and a "brain-drain" of competent teachers. In KZN, due to right-sizing, rationalisation and redeployment of teachers that was implemented since 1996, many teachers opted for VSP's as the easy way out. This, however, was not granted to science teachers as they were considered as key personnel. Whether the refusal, has resulted in demotivated teachers, remains to be seen, but several

qualified science teachers, have considered other options such as emigration and industry, adding to the "brain-drain". The insecurity surrounding redeployment and the larger classes that teachers now have to teach, have added to the woes of the science teacher. This tends to degenerate into a volatile culture of teaching and learning.

The variables receiving most attention have been teacher sex according to Saha (1983). There seems to be a clear indication that the sex of the teacher impacts on student achievement, e.g. male teachers are more successful in science teaching, while females do better in language teaching and related subjects.

With the advancement of science and technology, the role of the science teacher has assumed added dimensions. It is no longer limited to the classroom and laboratory; it now encompasses such areas as community health, preservation of the environment, conservation of resources, protection of wildlife, and survival of the human race (Rajput 1990). The science teacher has a pivotal role in all the issues that affect the individual, the community, the nation and the world. This is also true when considering similar demands placed upon KZN teachers, who have to perform their teaching and administrative tasks, even without the help of laboratory assistants.

Teachers' value orientations to their subject matter influenced their choice of content, their use of textbooks, pedagogical strategies, and their perceptions of students' instructional needs (Gudmundsdottir 1990). The act of teaching is saturated with values, both explicit and implicit, because teaching involves evaluation, judgement and choice, all essential qualities in values. Values affect choice of curriculum content - which eventually affects academic achievement (Gudmundsdottir 1990).

Teachers' perceptions of their students reflect social patterns of dominance in a society. This is particularly true when groups are ethnically defined.

Ethnographic investigations of the school experience of minority groups students have found teachers' perception and cultural prejudices to be negative factors in those students' school experience (Reck, et al 1993).

Poor pupil performance during the November 1996 examinations in Physical Science in KZN was also attributed to the inexperience and language capabilities of markers (Sunday Tribune, 5 January 1997).

The teacher factors that could influence performance **positively** in **third world** countries are : appropriately trained science teachers; motivated and satisfied teachers; experience in teaching physical science as well as marking matric examination papers; ability to assist pupils with language difficulties; and reduced teaching loads and other duties.

2.2.4. PUPIL FACTORS

Some pupil factors that could contribute towards performance appear in Table 4 on page 21.

Some pupil factors, in table 4 were already discussed under 2.2.1. i.e. socio-economic and political factors; and 2.2.2. i.e. parental factors.

Student performance needs to be seen not as an end in itself but as an indication of the processing and structuring skills which lie behind it. How this is revealed is important for the teaching-learning paradigm (Behr 1987b).

Student quality, in the sense of general ability, intelligence, or scholastic aptitude, has long been recognised as the single most potent variable in scholastic achievement. That is to say, given any uniform educational treatment involving cognitive content, intelligence (indexed as IQ) predicts a greater proportion of the variance (individual differences) in achievement than any other single variable or known combination of variables independent of

intelligence. Other variables, such as the student's race and the socio-economic status, occupation, education, and income of the student's parents, all contribute relatively little to the prediction of scholastic achievement independently of the student's own IQ (Jensen 1983).

TABLE 4 : PUPIL FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
student attitude	as per socio-economic-political	as per socio-economic-political
poor school attendance	"	"
dropout due to pregnancy	"	"
drug abuse	"	"
gang formation	"	"
gender disparities	"	"
choice of schools	"	"
availability of parent	as per parental factor	as per parental factor
process of learning	-----	Behr(1987b)
pupil ability, aptitude and intelligence	Teachman(1996); Jensen(1983)	-----
pupil expectations	Voelkl(1993); Vollmer(1986)	Behr(1987a)
age	as per socio-economic-political	as per socio-economic-political
menstrual cycle	Boyle(1997)	-----
poor grasp of concepts	-----	Crossley(1977)
language problems	-----	Heyneman & Jamison(1980); Kahn et al(1995); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
self confidence	Vollmer(1986)	Behr(1987a)
gender disparities	as per socio-economic-political	as per socio-economic-political
demotivated pupils	-----	Daily News(10/10/96; 3/1/97)
choice of grades	as per socio-economic-political	as per socio-economic-political
culture of learning	"	"

Crossley (1977), also added that pupils that usually performed poorly in

Physical Science examinations did so as a result of their own poor grasp of concepts or their teacher's poor understanding and teaching of concepts. Language problems also seem to hamper pupils' grasp and understanding of concepts. There is a tendency of ESL pupils to resort to mother tongue to write or communicate in science (Kahn et al 1995:13).

Low achieving African-American students with higher expectations came from homes characterised by greater discussion of school-related activities, class studies, and school programs with parents, higher aspirations for their children, more parental monitoring of homework, and a greater number of intellectual items compared with low achievement/low expectation students. In addition, the low achievement/high expectation students came from homes with higher levels of socio-economic status and parental education (Voelkl 1993). Smith (as cited in Voelkl 1993), concludes that academic expectations may be a less deceptive, more realistic prediction of academic progress than aspirations. While one may hope to attain certain levels of education, expectations convey realistic considerations of opportunities and ability. "Expectations carry with them some notion of individuals' estimation of reality factors that may affect aspirations" (Voelkl 1993).

Cognitive learning styles also affect performance. Four types of cognitive learning styles considered were : concrete sequential(CS); abstract sequential(AS); abstract random(AR) and concrete random(CR). Students with CS style, i.e. progressing in a logical sequence based on concrete observations, clearly exhibited significantly higher levels of academic achievement. Other styles are related to low academic achievement.

Evidently, menstrual cycle variables play a small, but discernible role on academic learning outcomes, contributing both positively and negatively to performance. There is widespread societal belief that intellectual functioning is impaired to some extent and the academic performance is diminished during the premenstrual and menstrual phases of the normal monthly cycle (Boyle

1997). As this is a sensitive matter dealing with the opposite sex, I will not attempt to ascertain information in this regard for my research.

An additional factor that could have had a bearing on pupil performance was demotivated pupils, especially during the November 1996 examinations when several question papers were leaked and the examinations had to be rescheduled. This resulted in disappointed students who had to psyche themselves up all over again (Daily News, 3 January 1997).

Pupil factors that could impact **positively** on their performance in **third world** countries are : positive attitude towards schooling; good attendance at school; pupil ability to grasp concepts in science; pupil's language competency; pupil's expectations and confidence; motivated pupils; and correct choice of grades.

I will be researching many of the pupil-related factors that were discussed in 2.2.4, with an emphasis on qualitative, in-depth information gathered through the interview process as very little data (only newspaper reports), gave a detailed account.

2.2.5. SCHOOL FACTORS

A summary of school-related factors appear in Table 5 on page 24.

The GPM (1997:14), of South Africa criticised the ANC government in general for their poor handling of the transformation process in education, accusing the ANC of being inefficient and incompetent as well as making hasty decisions. In KZN, evidence of incompetence, inefficiency and hasty decision making exists, even though the province is governed by the IFP. This filters into the school environment, much to the frustration of school administrators, educators and pupils.

TABLE 5 : SCHOOL FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
incompetence, ineffective management	-----	GPM(1997); Sunday Tribune(5/1/97)
teacher-pupil ratio	Coleman(1968); Jensen(1983); Güncer & Köse(1992)	GPM(1997); Fuller(1985,1987); Rollnick & Reddy(1995); Fabiano(1995); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
per-pupil expenditure	Coleman(1968);Dyer(1968); Jensen(1983); Greenwald et al(1996)	Fabiano(1995); Fuller(1987); Lewin(1995); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
facilities / resources	Coleman(1968); Jensen(1983); Güncer & Köse(1992)	Makhurane(1995); Heyneman & Jamison(1980); Rollnick & Reddy(1995); Lewin(1992); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
quality of school	Güncer & Köse(1992)	Fuller(1985); Heyneman & Loxley(1982)
textbooks	Adams(1993)	Fuller(1985,1987);GPM(1997); Naidoo & Lewin(1996); Naidoo & Khumalo(1996); Kahn(1993); Heyneman & Jamison(1980); Fabiano(1995)
availability of laboratory	-----	Fuller(1985); Fabiano(1995); Rollnick & Reddy(1995)
classroom organisation	-----	Fuller(1987)
school management structure	Jensen(1983); Adams(1993)	Fuller(1987); Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
lack of space	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
poor maintenance	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
practical work	-----	Kahn(1993); Kahn et al(1995)
admission policy	-----	Kahn et al(1995)
inequity	-----	Sunday Times(5/1/97)

This is further compounded if the structure and management of the school is not organised in a manner that promotes academic achievement. Naidoo and

Lewin (1996:22) also contend that low levels of efficiency were related to a high failure rate when examining data for KZN.

Naidoo and Khumalo (1996:33), in their survey of Physical Science in KZN, have found that lack of supervision by management (especially Heads of Department), has meant that management contributed minimally in developing science at schools. However, the absence of supervision must be seen in context of the call by teacher unions (especially SADTU), to do away with classroom based supervision. Don Adams (1993:18), worked on effective school management in USA, and has identified some school management principles that lead to better academic achievement, viz. provision of adequate facilities; provision of regular local INSET for teachers; and development of co-operative school-community relations.

Bruce Fuller (1987), having researched numerous Third World countries (South Africa excluded), pointed out three areas of school management that can influence academic achievement. These are : the quality of the school principal; number of class shifts (platoon system); and student boarding. If the quality of school principal is such that he/she boosts management and instructional skills, then this will have a positive influence on academic achievement. The number of school shifts according to Fuller (1987) has a negative bearing on academic influence, since this tends to cause a strain on resources. Student boarding has a positive influence as it raises student motivation and achievement. Finally, the Sunday Tribune (5 January, 1997), quotes John Pampallis, director of the Centre for Education Policy Development :

"There needs to be improvement in educational management, and much more common participation in the running of schools. The South African Schools Act provides the framework for that. Parents need to play a more active role in schools, so that they can make demands on teachers and on their children. Teachers must be encouraged to teach, they need to be retrained, become more committed, and prepare their lessons. They need to ensure that pupils are taught for all 200 school days in a year. These are all things that have not been happening in African schools. "

Internationally, the Coleman (1968) report indicated that equal school input would produce equal school outputs, i.e. if all schools had the same facilities, quality of teachers, teacher-pupil ratio, per-pupil expenditure, etc. then the pupils would achieve the same results. Critics of Coleman, viz. Bowles (1968) and Dyer (1968), disagreed in part with the Coleman report. Bowles (1968) added that even with ideal inputs, a substantial gap existed, since the actual processes involved at schools were being ignored. Other critics of the Coleman report, viz Heyneman and Jamison (1980); Heyneman and Loxley (1982), felt that school facilities and teacher quality predicted only 40% of the school influence on academic achievement, thus 60% of school variables were still unexplained. Jansen (1995) argues as well that studies on effective schools have ignored the range of other school effects.

First world research on effect of teacher-pupil ratios on academic achievement have been documented by Coleman (1968); Jensen (1983); and Güncer and Köse (1992). All have shown that the lower the teacher-pupil ratio, the greater the academic achievement of pupils, provided other conditions are equal. Third world research on teacher-pupil ratios were cited by Fuller (1985,1987); Rollnick and Reddy (1985); Naidoo and Lewin (1996); Naidoo and Khumalo (1996); Fabiano (1995); and the GPM (1997). Whilst Fuller and Fabiano considered Third World countries outside South Africa, the others referred to the South African context, with Naidoo and Lewin, and Naidoo and Khumalo specifically referring to the situation in KZN. Fuller found that teacher-pupil ratios had little or no effect on academic achievement in the Third World countries that were considered. However, no exact magnitude of the teacher-pupil ratio was provided. Fabiano on the other hand, in his address at the 1995 ASTE conference, concluded that by training more science teachers, the teacher-pupil ratio in African countries would be reduced allowing for more meaningful teacher-pupil interaction and therefore lead to better achievement. In fact, the National Teacher Audit (Hofmeyer & Hall 1996:29) provided the following statistics : The national teacher-pupil ratio was 34:1 as at 1995 in South Africa. The ratio for KZN was 35:1. This does not paint a full picture

until the ratios for the different race groups are studied. These appear in the table below.

	African	Coloured	Indian	White	Total
KwaZulu-Natal	40:1	24:1	21:1	22:1	35:1
National	39:1	24:1	22:1	20:1	34:1

While the teacher-pupil ratio for the other race groups seems reasonable, that for the African group is unusually high. These statistics do not indicate the size of actual science classes, but one would tend to argue in favour of smaller teacher-pupil ratios to make practical work effective. The GPM (1997:17) once again levels criticism against the enforcement of teacher-pupil ratios (1:40 in primary school and 1:35 in secondary schools), claiming that this could impact negatively on pupil achievement as well as limit the choice of subjects by pupils. The public is led into believing that by applying the stipulated ratios, excess teachers would be retrenched, therefore more money would be available for resources. What we are not certain about is how the RDP allocation for education would be utilised in each province or even nationally.

In the Third World countries, low school quality implied low levels of achievement (Fuller 1985). Textbooks, writing materials and teacher quality influenced achievement. Availability of laboratories, paper credentials of teachers and teachers salary levels were unrelated to achievement. Fuller (1985) admits that very little research has been conducted on teaching practices and classroom organisation. Fuller (1987) provides a summary of various school factors related to achievement in the Third World countries. These are school expenditure, specific material inputs, teacher quality, teaching practices and classroom organisation, and school management and structure.

Güncer and Köse (1992) concluded their research on Turkish pupils by stating that pupils attending schools with better resources achieved higher academic results than those attending schools with poor resources. Material factors in schools - such as more textbooks or writing materials - exercise more influence on achievement in the Third World than in industrialised countries (Fuller 1987).

Few observational studies within Third World classrooms have occurred. School effects in the Third World seem to be stronger in rural areas and among lower income pupils, compared to urban middle-class areas (Fuller 1987). Within industrialised countries, much is known about the relationship between schools' material inputs or social practices and pupils' achievement levels. Less is known about school effects in developing countries (Fuller 1987).

James Coleman (1968) emphasised that equality of educational opportunity was to bring about equality especially when considering the racial discrimination that Negroes were faced with in the USA. Almost thirty years later, South Africa also seems to argue that by merely equalising resources and per-pupil expenditure, an improvement in academic achievement would be a formality. This however, as Dyer (1968) points out might not be the only solution as improvements are deeply rooted in the economic, social, and cultural levels of the communities, and

"no important educational improvements in these schools are likely to take place until changes have occurred in the total community complex in which the school is embedded".

In First World countries, Greenwald, Hedges and Laine pointed out that

"Over the last two decades, the question of how to improve the achievement of students in our nation's schools has gained increasing prominence. While expenditures have risen dramatically over this period, it has not been apparent that achievement has risen at all, much less commensurately." (Greenwald, et al 1996).

Jensen (1983) concluded that per-pupil expenditure, amongst other factors such as teacher's qualifications, teacher-pupil ratio and special services, has little overall effect on achievement in First World countries. By implication, per-pupil expenditure would have a greater influence in Third World countries. Data cited in Fuller (1987) showed that 6 of 11 analyses confirmed that higher expenditures provided higher quality teachers and learning resources, leading to higher achievement. Furthermore, 16 out of 24 analyses in Third World countries studied by Fuller, confirmed that the greater availability of textbooks and reading materials will raise the quality of learning activities, increasing achievement. The presence and active use of a school library boosts achievement were positively supported in 15 of 18 studies in Third world countries, according to Fuller.

As far as science resources are concerned, Naidoo and Lewin (1996:22), tentatively concluded that most of the schools studied in their data for KZN, were not well equipped to teach science though some appear to succeed relatively well with modest resources. This would account for poor performance in science amongst other factors. Naidoo and Khumalo (1996:16), added that in KZN, due to the lack of laboratories, equipment and consumables, teachers may be able to teach certain aspects of the physical sciences adequately, but practical work, project work and revision exercises will be neglected aspects. Moreover, innovative teaching will be more difficult under these resource conditions. Teachers are forced to be more resourceful to teach under these conditions. It is important that these teachers be trained to teach under these conditions, particularly if the resource conditions of schools don't improve in the near future.

Rollnick and Reddy (1995) in their address at ASTE 95, have identified some contributory factors to poor quality of science, viz. lack of resources, lack of laboratory facilities, lack of adequately qualified science teachers, large classes, disparities in terms of gender, race, location, poverty.

These factors discussed, need to be seen in the context of the appalling situation in KZN regarding poor condition of schools; lack of laboratories, resources and trained science teachers; poor financial administration; and an indifferent culture of teaching and learning (Sunday Tribune, 10 August 1997 - **Schools of neglect** - quoted in Chapter 1). Where comparative studies between different types of schools (model C vs government; rural vs urban; ex-HOD vs ex-DET; etc), may exist, research on performance in a single examination for matriculants definitely does not exist in KZN, hence my attempt is to fill this gap through this study.

School factors, most likely to influence pupil performance **positively** in **third world** countries are : effective school management; low teacher-pupil ratio; greater per-pupil expenditure; adequate facilities and resources; properly maintained equipment; and completion of practical work.

2.2.6. EXAMINATIONS

Examination-related factors are to be found in Table 6 on page 31.

Crossley (1977) merely looked at a linear cause-effect reasoning for poor performance in examinations, for the 1976 Physical Science examinations for matriculants under the Division of Indian Education, eg. poor performance in examination paper implied poor teaching. Poor performance in Chemistry compared to Physics was due to the highly conceptual nature of the subject. Some reasons suggested were :

- i. the questions set were far too difficult, or
- ii. the pupils were experiencing great difficulty in grasping the material,
or
- iii. the teachers were also experiencing the same difficulty and as a consequence are not imparting the information adequately.

TABLE 6 : EXAMINATION RELATED FACTORS

FACTOR	FIRST WORLD	THIRD WORLD
leaked papers	-----	Behr(1982a); GPM(1997); Daily News(8/11/96); Sunday Times(17/11/96;24/11/96); Sunday Tribune(5/1/97)
irrelevant syllabi	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
language problems	as per pupil factor	as per pupil factor
inappropriate assessment	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996)
unpopularity of Physical Science	as per socio-economic-political	as per socio-economic-political
practical work	as per school factor	as per school factor
postponement of examinations	-----	Daily News(8/11/96); Saturday Paper(9/11/96); Post(13-16/11/96; 20-23/11/96)
experience of markers	as per teacher factor	as per teacher factor
scrapping of examination system	-----	Post(13-16/11/96); Sunday Times(24/11/96)
pass rates	-----	Post(1-4/1/97); Daily News(3/1/97)
SAFCERT	-----	Post(1-4/1/97)
computer glitches	-----	Daily News(3/1/97)
OBE	-----	Daily News(3/1/97)
standards and setting of papers	-----	Sunday Tribune(5/1/97)
irregularities	-----	Sunday Tribune(5/1/97)

Factors only evident from examination papers were considered with no regard for other contributory factors such as socio-economic factors, etc. In addition, the 1976 academic year for non-white pupils was disrupted for a considerable length of time due to Soweto uprising, burning of schools, unrests, etc. Thus Crossley's research was mainly quantitative with very little qualitative exploration, i.e. no in-depth investigation into reasons ii and iii cited above.

The senior certificate examination controlled by the Director of Indian Education, Gabriel Krog, resulted in tragedy in 1981 as there were numerous examination papers that were leaked due to poor security and control of papers. As a result of the rescheduled examinations, numerous papers had to be rewritten and pupils re-orientated (Behr 1982a). (This was yet another examination that was preceded by boycotts throughout schools, universities and colleges). The director of Indian Education, G. Krog responded to certain inaccuracies contained in the article (Behr 1982a), which alleged leakages of papers within the Department. However, a pupil had been convicted in court for this offence (Behr 1982b) but the source was still some "supplier" in the Education Department. The House of Delegates, in 1984 was in control of Indian Education, but the leakage of examination papers continued even during the 1996 matric examinations. The Sunday Tribune, 5 January 1997, appropriately stated :

"Examination leaks and technical problems plagued the DET for years, and leaks were endemic in HOD schools. It is only now that formerly white schools are affected that there has been a public outcry - and the outcry is good since it will force the government to ensure cheating does not happen again"

During the roundtable discussions on what went wrong with the matric examinations for 1996, the Director for Examinations, indicated that the Administration in KZN was not fully prepared to handle the mammoth examinations for 1996. He qualified this by stating the decision to have the first common examinations for matrics in KZN in 1996, was a political one and not the request of the Department. However, the Department tried its best to cope with the task in the short space of time. They would have preferred the first common examination being held in 1997, as they would have been geared to handle it. The leakage of examination papers in KZN for 1996, is evidence that the Department was unable to handle examinations on a large scale. This also created other psychological problems amongst pupils due to the rescheduling of examinations. The processing of results (marking and computer entries) was an area of concern, since pupils and parents had no

faith in accepting results that were riddled with errors (Daily News, 3 January 1997). In addition, there were numerous pupils convicted of committing examination irregularities (Sunday Tribune, 5 January 1997), yet the South African Certification Council (SAFCERT), was satisfied that the integrity of the examinations had been maintained.

The irrelevance of the present Senior Certificate Physical Science syllabus, is well documented in Naidoo and Lewin (1996:6). The syllabus, for one is Eurocentric and therefore completely divorced from the South African context. Furthermore, the syllabus is biased towards university entrance requirements yet only a very small percentage of those with school physical science pursue science-related studies at tertiary institutions. This alone could account for the majority of students performing poorly in physical science as it has no utility value.

Due to the irrelevance of the science syllabus, and the nationwide problems regarding leakage of examination papers and the enormity and incapacity to handle the task from an administrative point of view, many have called for the scrapping of an external examination (Post 13-16 November 1996; Sunday Times 24 November 1996). This provides an ideal opportunity for politicians and educationists to sell their ideas on Outcomes-Based Education (OBE).

Examination related factors that seem to have a **positive** impact on pupil achievement in **third world** countries are : smoothly run examinations, without disruptions and leakages; relevant syllabus; experienced sub-examiners; consistency in standards and setting of examination papers; and guidance through subject advisors.

The literature reviewed on examination-related factors reveals that the handing over of examinations in KZN to the smallest ex-department (ex-HOD), may have been pre-mature as such a department may have appeared efficient only in handling a small number of candidates (+/- 15 000) compared to 150 000

for 1996. The examination itself was disrupted due to leakages, that placed the integrity of departmental officials into question. Whether the rushed examinations really assessed student ability or not remains to be seen, hence my research will try to close this gap somewhat.

2.2.7. POLICY AND PLANNING

From a policy and planning point of view, factors that could have a bearing on academic achievement, appear in Table 7 below.

TABLE 7 : FACTORS RELATED TO POLICY AND PLANNING

FACTOR	FIRST WORLD	THIRD WORLD
incompetence and effective management	as per school factor	as per school factor
hasty decisions	-----	GPM(1997)
inadequate teachers	as per teacher factor	as per teacher factor
teacher-pupil ratios	as per school factor	as per school factor
per-pupil expenditure	"	"
VSP and "brain-drain"	as per teacher factor	as per teacher factor
facilities / resources	as per school factor	as per school factor
lack of support for teachers	-----	Naidoo & Lewin(1996); Naidoo & Khumalo(1996); Daily News(3/1/97)
poor maintenance	as per school factor	as per school factor
admission policy	"	"
shortage of lab. assistants	-----	The Natal Mercury(14/7/97)
shortage of furniture	-----	Sunday Tribune(10/8/97)
inequity	as per school factor	as per school factor

Simply redistributing existing resources towards the least favoured schools (which would have little or no direct cost) is likely to have much bigger effect on those schools and little or no effect on those which already enjoy surpluses

of qualified teachers, materials, etc. The incremental rate of return on investment to raise achievement in schools which have no books or facilities will be much greater than similar inputs in well funded institutions (Lewin 1992:59).

Due to financial constraints, it seems unlikely that there is scope for substantial increases in the national education budget. Improvements therefore need to come from increases in internal efficiency and re-allocation (Lewin 1995:1). However, in an attempt to re-allocate funding on education, maladministration has been the order of the day in KZN, as there never seems to be funds for anything in this Province, yet almost 100 million rands of RDP funding, was returned to the treasury as no use was made of it during 1995/1996. Whilst teacher audits have been conducted nationally, an urgent audit of government spending needs to be carried out by foreign experts so that public funds can be accounted for and impartiality could be adhered to. At least some funds should be provided in equipping matriculants or their teachers with sufficient copies of the prescribed textbook(s) as well as duplicating facilities, as the lack of text material leaves the teacher and pupil with very little to work on.

If we promote a "science and mathematics for all" policy, the approach to science and mathematics education must change. Students would take these subjects throughout the school years. "Science" would mean a new balanced combination of physical science, life and earth science. Additional science subjects should be made as available as possible for those with the interest and aptitude to study further (Kahn 1993:32).

Student and teacher science anxiety and efficacy and strategies that reduce anxiety and increase efficacy are worthy of attention in teacher education if we wish to improve the quality, quantity, and success of science curriculum and instruction (Czerniak & Chiarelott 1990).

Positive aspects related to policy and planning that would lead to positive influence on pupil performance in **third world** countries are : efficient management and general administration of education; timeous notification of changes in policy to be communicated to all concerned role players; adequately funded schools; sufficient supply of resources; reduced teacher-pupil ratios; support services for teachers; provision of laboratory assistants; and proper maintenance of equipment.

2.3. IMPLICATIONS

I agree with Lewin (1992:72) that it is not possible to arrive at a list of universally valid generalisations concerning the factors that affect science achievement. There are many different factors that, in different circumstances, seem to have causal relationships with achievement. Which ones are significant will depend on which characteristics of the particular system, school, teachers, students are of interest (Lewin 1992:72).

There are a number of key parameters which would seem likely to influence the strategies for planning effective investment in science education. These include :

- a. the proportion of students currently enrolled at different educational levels, and the proportion of those who are enrolled who specialise in science;
- b. the degree of financial constraint on investment in secondary education;
- c. the evidence of shortages and surpluses in supply and demand for science qualified school leavers at the next level of education and in the labour market;
- d. the level of disparity in participation in science education at different levels (eg. by gender, community, area of residence);
- e. the levels of performance on public examinations which can indicate how many students learn how much science and serve a proxy estimate for levels of scientific literacy; and
- f. the historical patterns of provision - streaming, selection, curriculum, resource allocation

(Lewin 1995:4).

An attempt to raise science achievement must include :

- a. changing teaching methods,
- b. increased curriculum relevance.
- c. increasing time available for mathematics and science,
- d. reconsidering language policy,
- e. improving career guidance, and
- f. offering scholarships and organising competitions

(Lewin 1995:14).

It has been argued that an educated population will be more productive than an illiterate population and that an educated population is less likely to suffer from common communicable diseases arising from poor sanitation. In other words, education is an investment for the pupil, parents or guardians as well as the nation. It is therefore correct to say that before any country can reap the fruits of education, it must first of all invest in education generally and science and technology education in particular. In the case of science and technology, such investment is quite high but inevitable (Fabiano 1995).

From the wide range of factors gleaned through review of literature, I have concentrated on similar categories but narrowing down some of the factors relevant to third world countries. Chapter three that follows, outlines in detail, the research methodology that I have employed. I have opted for a qualitative, investigative methodology as I have not come across such a study in the literature reviewed.

CHAPTER THREE : RESEARCH METHODOLOGY

3.1. INTRODUCTION

As outlined in the purpose of this research, my intention is not to exclusively do a quantitative analysis of factors that have influenced academic performance of pupils in std 10 Physical Science. Rather, the emphasis is on a qualitative (in-depth) investigation of what pupils, teachers and examiners perceive as the contributory factors to high and low achievement. As such, I will be making some use of quantitative analysis to support the qualitative data.

In the previous chapter, the literature reviewed, showed that very little qualitative research has been done in South Africa, least of all the province of KZN, hence, my interest in doing a qualitative research stems largely from this. Furthermore, "qualitative research is holistic, in the sense that it attempts to provide a contextual understanding of the complex interrelationships of causes and consequences that affect human behaviour" (Brock-Utne 1996). In doing so, qualitative research seeks to avoid both the deliberate manipulation of variables and the study of attitudes or indicators as variables isolated from the wider totality. A further consequence of this holistic approach, is that qualitative research tends to incorporate a wide variety of specific research techniques, even within one research project (Vulliamy, Lewin & Stephens 1990 as cited in Brock-Utne 1996).

In chapter four, use will be made of quantitative analysis to support relevant statistical data. Thus one cannot really categorise this research as being totally qualitative.

3.2. PLANNING FOR DATA CAPTURE

3.2.1. Choice of schools

My original plan was to deliberately choose three schools that were previously predominantly racially segregated viz. an ex-House of Delegates (HOD)

school, an ex-Natal Education Department (NED) school and an ex-Department of Education and Training (DET) school. The reason for this was that these schools, up to March 1996, had written separate matriculation examinations and it would have been an interesting research finding to see how they would have performed in the first ever common matriculation examination in the KZN province for all secondary schools. However, much to my disappointment, this did not materialise for three reasons :-

- i. the refusal by the acting Deputy Principal of the ex-NED School to release students comprehensive results and contact addresses. This refusal was conveyed to me, in writing (see appendix I).
- ii. difficulty experienced in locating the ex-DET School, as road markings were poor and I kept getting lost, landing many times in the backyard of residents - much to their bemusement. Schools that were found, only had pupils up to std 7.
- iii. time factor - as it was getting to the end of February 1997, finding alternate ex-NED and ex-DET schools did not work out.

I then opted for three ex-HOD schools which were identified for this research, viz. school X, Z and W. But, even this was not without any problems. At school W, the science teacher whom I worked with, was unable to provide the contact telephone numbers and addresses of six pupils - and again, as time was running out, school W was replaced by school Y. The three schools ie. X, Y and Z were therefore finally chosen for this research. The three schools were labelled in alphabetical order, corresponding to the order of pass rates obtained by matriculants of each school for the November 1996 examinations, with school X obtaining the best pass rate and school Z, the worst. These schools were all within a 20km radius of Durban. The case studies were now open!

3.2.2. Initial School Contact :

Once the three schools were identified, permission to use pupil data was obtained through official letterhead of the university (see appendix II). An initial visit was made to each of the three schools to obtain the comprehensive, computer print-out of each pupils' results for the 1996 matriculation examinations, as well as to meet the Physical Science teacher to explain what the nature of my research was all about. Each school's results were then analysed and ranked, after which about 8 pupils from each school with high Physical Science symbols and about 8 with low Physical Science symbols were identified. The Physical Science teacher then provided the contact addresses and telephone numbers of these pupils.

3.2.3. Contacting Pupils

Since the pupils that were targeted for this research, were no longer in school, making contact with them was time consuming as they were located in all parts of the country and in various institutions or places of employment. After several attempts, and at least a week later, a total of eighteen pupils were contacted (six from each school), and much to my surprise, they had consented to participate in the research even though they stood to gain nothing from it. Since some of the pupils were studying outside the province of KZN, I had to wait for their holiday period (viz. July 1997) in order to make an initial meeting, subsequent to telephonic conversation, with each chosen pupil. During this encounter, pupils were informed about the nature of my research and what was expected of them. In addition, some data regarding their background was obtained in respect of intended field of study, reasons for choosing Physical Science, present study and expected results (in Physical Science) - (see appendix III). At the end of this first meeting, interview dates and times were planned.

3.2.4. Interview with Teachers

Immediately after knowing which pupils were going to be the subjects of this research, their corresponding teachers were informed. The teachers were required to first complete a survey on pupils providing the following details: grade of pupils, number of days absent, std 9 results, expected std 10 results, number of years teacher knew pupils, whether pupils were repeating std 10 or not (see appendix IV). Each teacher was then asked to compile a general report/profile on each pupil which was useful during their interview, scheduled for a week thereafter.

At this point, I must concur with Butler-Adam (1983), that the large time lapse between the actual events (writing of examinations and awareness of results) and the subsequent interviews with teachers and pupils could yield incomplete data.

Since this research involves two main critical questions, it might be necessary to discuss the instrument, design and analysis separately for each of these critical questions.

3.3. CRITICAL QUESTIONS

3.3.1. Pupil's Perceptions

Initially, a draft interview schedule was presented to my supervisor and after some deliberation and suggestion, changes were made to the questions contained in the schedule and the format. This amended schedule was then piloted with two pupils and certain ambiguous questions were reworded so that it would be easily understood by pupils. A fellow M.Ed.(Science Ed.) colleague also helped in ironing out any flaws there were in terms of multiple level questions. The final version of the interview schedule is contained in appendix V. In addition to responding to the questions posed during the

interview, pupils were also required to complete seven questions based on a five point scale aimed at measuring pupils level of confidence before an examination. I have adapted the confidence scale from Vollmer (1986). The self-confidence scale test is included as appendix VI.

During each interview, the pupils were first required to complete the self-confidence test. The pupils merely had to respond to each of the seven items, by encircling the letters A, B, C, D, or E, where A represented the usual case of occurrence and E for seldom, with C being the neutral position and B and D the case which sometimes occurred. This took them about five minutes to complete. This was then followed by administering the semi-structured interview schedule which lasted about thirty minutes. The interviews were recorded on audio-cassettes which did not seem to affect the interviewees, as they seemed unaware of the tape recording. This may have largely been due to the pre-visit which could have led them to trust and confide in me.

As each interview was completed, the audio-cassettes were not transcribed verbatim. Instead, for each question asked, the salient responses were noted down on a large sheet of paper, for each school. The audio-cassette was played a few times in order not to omit any important points being made. Due to noise and some distortion, the audio-cassettes were processed on a daily basis so that any noise and distortion was filled in from "memory" of the interview as it occurred.

My rationale for interviewing, rather than mere completion of a questionnaire stems from suggestions made by Ackroyd & Hughes (1992:102) i.e.

"An interview allows individuals to report on what they feel, are, have, tell others about their lives, disclose what their hopes and fears are, offer their opinions, state what they believe in, ... and so on; in short, they can impart masses of information about themselves".

Thus by interviewing, I was able to probe into responses and therefore add greater quality to the investigation. In addition to obtaining consent from

participants both for the purpose of participating in the interview and also for making an audio-recording, the participants were also informed about the confidentiality of the information they provided. They were assured of being anonymous as suggested by Maruyama and Deno (1992:18). For this reason I have labelled pupils from each school as follows: School X - pupils X1, X2, X3, X4, X5 and X6; School Y - pupils Y1, Y2, Y3, Y4, Y5 and Y6; and School Z - pupils Z1, Z2, Z3, Z4, Z5 and Z6. The rankings 1 to 6 were not randomly assigned - instead they were deliberately ranked from 1 to 6 based on their final std 9 percentages where 1 was for the highest mark and 6 for the lowest mark.

3.3.2. Teacher's Perceptions

An interview schedule was also drawn up for the purpose of interviewing the three teachers of the different schools viz. school X, school Y and school Z. Thus the teachers interviewed from each school were identified as TX, TY and TZ, with X, Y and Z as the schools. The teacher interview schedule underwent the same process of refinement as the pupils' interview schedule. The final interview schedule for teachers appears as appendix VII. A pre-interview survey was also drawn up to capture data pertaining to the teacher's qualifications; years of experience as a teacher, as a std 10 Physical Science teacher, as a sub-examiner; membership of professional bodies; involvement in Science; and extra curricular (community) involvement. This survey form appears in appendix VIII.

Prior to the actual interview of teachers, the above survey form was completed first as knowledge of the teacher's qualification and experience was required for the interview. In addition, the teachers' interviews had to be completed before interviewing the pupils as the pupils had to be informed about their teacher's qualifications and experience. The interview of teachers lasted approximately forty five minutes each even though the schedule contained similar questions to the schedule for pupils. The additional time was

due to the fact that each teacher had to comment on the individual performances of six pupils, hence the longer time. These interviews were also recorded on audio-cassettes.

The recording of data from the audio-cassettes was transcribed in exactly the same way as that for the pupils.

3.3.3. Examiner's/Sub-examiner's/Moderator's Perceptions

This area of investigation was conducted in two stages. The first stage involved obtaining the Senior Certificate report on the 1996 Physical Science examinations which was available to all secondary schools in KZN from June 1997 onwards. This essentially provided a general view of areas of strengths and weaknesses that pupils and teachers have displayed. However, the second part of the investigation, was to interview at least one examiner and two sub-examiners (one for Paper I and one for Paper II), to obtain their reflections for good and poor performance of pupils. For this, a mini-interview schedule was drawn up and administered (see appendix IX).

3.3.4. Analysis of school results

For each school, the final results of all pupils were analysed to determine the different quality passes, i.e. exemptions; senior certificates and failures. The Physical Science pupils' results were then analysed within these schools to determine the quality of passes. The results were also classified according to gender, race and age for each school. A correlation of pupils' std 9 marks and expected std 10 marks for Physical Science was made with their final std 10 marks obtained. All marks available as symbols were estimated, eg. an A was rated 85%, a B as 75%, etc. The mean and standard deviations were also calculated for the above set of marks.

3.3.5. Analysis of the question papers

The November 1996 Physics (PI) and Chemistry (PII) examination papers were analysed to determine time allocation for the completion of the papers; the general layout of the papers; and the use of language, especially in terms of catering for ESL speakers.

3.4. VALIDITY AND RELIABILITY

According to Tesch (1990:304), qualitative research is to a large degree an art. The question of its validity does not depend on replicable outcomes. It depends on the outcomes. It depends on the employment of a data reduction process that leads to a result that others can accept as representing the data. A successful qualitative data reduction, while removing us from the freshness of the original, presents us instead with an image that we can grasp as the "essence", where we otherwise would have been flooded with detail and left with hardly a perception of the phenomenon at all. In qualitative research no two scholars produce the same result, even if they are faced with exactly the same task. Their differences in philosophical stances and individual styles will lead them to perceive and present the phenomenon each in his/her own way.

Since, a portion of this research relies on quantitative data analysis, reliability and validity will be of relevance. Reliability, here refers to the accuracy and consistency of a measure in assessing whatever it measures, while validity refers to the extent to which a measure actually assesses what it is intended to measure (Maruyama & Deno 1992:69). Brinberg & McGrath (1985:26) adds that validity is not a commodity that can be purchased with techniques. Validity is a concept designating an ideal state - to be pursued, but not to be attained. Validity has to do with truth, strength and value. Dey (1993:45) points out that the essence of reliability is consistency through repetition. In qualitative data, replication is difficult if not an impossible task. However, in corroborating evidence, internal replication needs to be undertaken to

test the reliability of the data. The audience must be given a chance to scrutinise research procedures and to decide whether the results ought to be reliable.

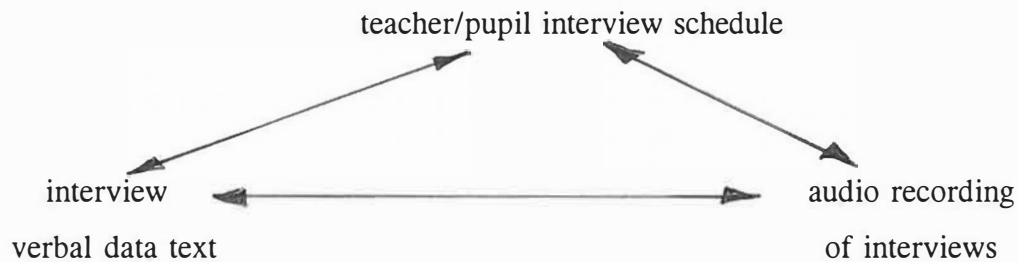
Triangulation is one technique of validation. The best way to develop knowledge of a subject is to study it from a number of points of view (Ackroyd & Hughes 1992:171). More data can lead to a fuller appreciation of complex topics. The advantages of triangulation are that it encourages a more systematic continuity of both theory and research. By combining multiple observers, data sources, theories and methods, social researchers can overcome the bias that is regarded as inevitable in single-method, single-observer, single theory studies.

In practice, the implementation of a mixed-method approach or strategies of triangulation quite often means that the research design is split into two distinct and mutually exclusive parts : different data sets are collected, one of them consisting of numerical data, for example collected with survey questionnaires, and the other of unstructured textual material, for example transcripts from open-ended questions in questionnaires, interviews or verbal records from participant observation (Kelle 1995:152). These different data can then be analysed in accordance with the widely accepted division of labour between the two methodological paradigms : numerical data by means of statistical procedures, unstructured verbal data using some kind of interpretive or hermeneutic method.

Before going into depth as far as validation of this actual research is concerned, perhaps, the various data that were collected for this research needs to be listed :

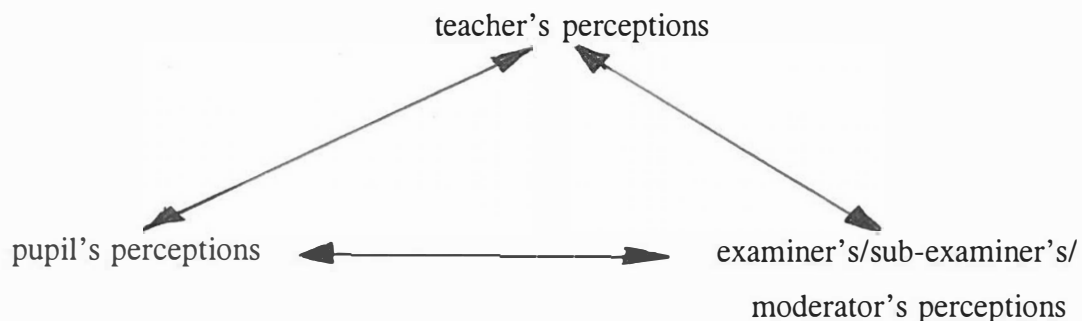
- ✧ Comprehensive senior certificate results of each school - November 1996
- ✧ Pupil Interviews
- ✧ Pupil Self-Confidence Evaluation
- ✧ Teacher Interviews
- ✧ Teacher Profile on Pupils
- ✧ Teacher Data
- ✧ Newspaper Reports
- ✧ Question Papers - Physical Science - November 1996
- ✧ Round Table Discussion - Senior Certificate Examinations - November 1996
- ✧ Examiners / Sub-Examiners / Moderators Report - Physical Science - November 1996

Considerable use of triangulation techniques to verify and check on data, for example, both teacher interview data and pupil interview data will be examined according to the following schema :



i.e. for certain questions contained in the interview schedule, extracts from the interview will be textually represented (in coded form) in the next chapter. The audio recordings are available for examination.

Individual pupil performances within each school context will also be subjected to triangulation to check on consistencies. The following schema will be tried :



i.e. for selected questions, commonly posed to teachers, pupils and examiners / sub-examiners / moderators, data will be compared so as to represent a consistent account of pupil's performance.

Where statistical analysis will be carried out, these will be subjected to reliability tests. The final word on this : "when dealing with qualitative data, it is better to speak of trustworthiness rather than reliability and validity" (Guba & Lincoln - as

cited in Tesch 1990:123). Thus a great deal of the data obtained from teachers and pupils were not subjected to any reliability test, but were accepted as they were given, on trust.

The data collected for this research, were used in the following manner :

- Comprehensive results of schools - this was used to obtain :
 - a) general matriculation statistics in terms of male and female African and non-African candidates entered for in the 1996 senior certificate examinations for each school. This was divided further to ascertain the number of pupils that have passed with matric exemption; passed with senior certificate only; failures and absentees.
 - b) general race and gender distribution for each school
 - c) overall pass rates
 - d) symbol distribution for Physical Science according to grades.
- Pupil Interview Data was triangulated with Teacher Interview Data and Examiners /Sub-examiners / Moderators Data.
- Pupil Self-Confidence Evaluation - this was utilised to gauge how confident pupils were during the examinations with particular emphasis on Physical Science.
- Teacher Interview Data was triangulated with Pupils interview data and data provided by Examiners / Sub-examiners / Moderators.
- Teacher Profile on Pupils - The number of days of absenteeism was investigated during pupil interviews to ascertain the nature or cause of prolonged absenteeism. Pupils' std 9 and expected std 10 results was correlated against final std 10 results obtained.
- Teacher Data : essentially, this provided information on the teachers qualifications and experience as a Physical Science teacher at the std 10 level.
- Newspaper Reports : - several articles were utilised throughout the body of this research to substantiate certain viewpoints.
- Question Papers - Physical Science - November 1996 : this was analysed as per plan in 3.3.5.
- Round Table Discussions - Senior Certificate Examinations - November 1996 : as this was already video taped, details contained here were utilised in the discussion.

Examiner's / Sub-examiner's / Moderator's Report - Physical Science - November 1996 - As mentioned, much of the data contained here was triangulated against pupil and teacher perceptions. However, it must be noted that comments made by the above group of people were more generalised rather than specific to a school or individual pupils selected for this research.

Data collected will be represented in the form of tables, figures (graphs), and selected quotations in chapter four. This is followed by an analysis of the different perceptions of pupils, teachers, examiner and sub-examiners as well as an analysis of school results and the question papers in Physical Science.

CHAPTER FOUR : PRESENTATION AND ANALYSIS OF DATA

4.1. INTRODUCTION

Before engaging in a thorough analysis of data that was collected for this research, I prefer presenting an introductory chapter on each school in terms of:

- a. Discussion of School and School results.
- b. Teacher data.
- c. Pupil data.

This will be followed by an analysis of the critical questions, and finally some quantitative analysis of each school's Physical Science results and the question papers.

4.1.1. General discussion of School and School results

SCHOOL X

Of the three schools chosen for this research, School X obtained the highest overall pass rate of 70% i.e. 101 pupils passed out of 144 candidates who wrote. The different passes obtained are represented in Figure 1 on page 51 which reveals that 49 pupils obtained an exemption pass, i.e. only 34% of candidates at this school qualified for university entrance. A slightly larger proportion, viz. 52 passed with senior certificate only representing 36% of pupils. The remaining 30% consisted of 41 pupils who failed and 2 pupils who were absent. The results are also presented gender-wise as well as distinguishing results between African and Non-African pupils. African pupils are those who were previously categorised as Bantu/Black.

A clearer gender/race distribution is provided in appendix XIa. This illustrates that this school had more male than female students writing the examinations i.e. 80 males compared to 64 females. But when this is studied in conjunction with the bar graph showing overall pass rates in appendix XIb, 57 (89%) female pupils passed compared to 45 (55%) of male pupils.

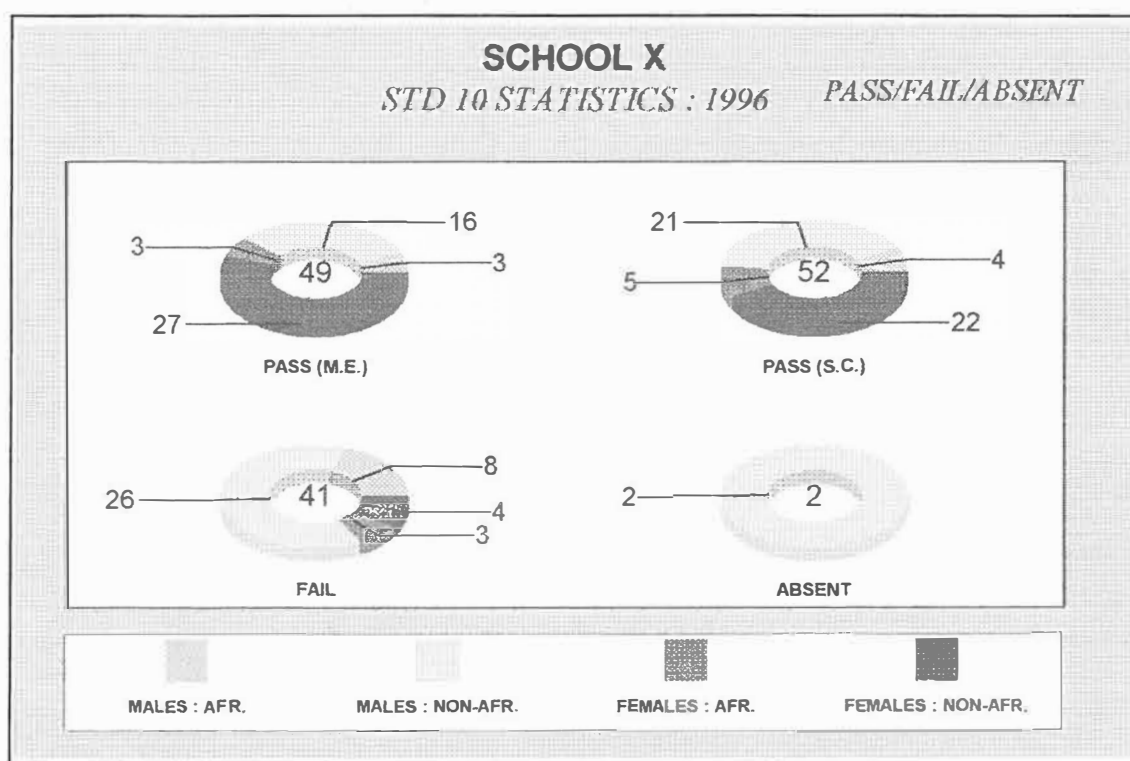
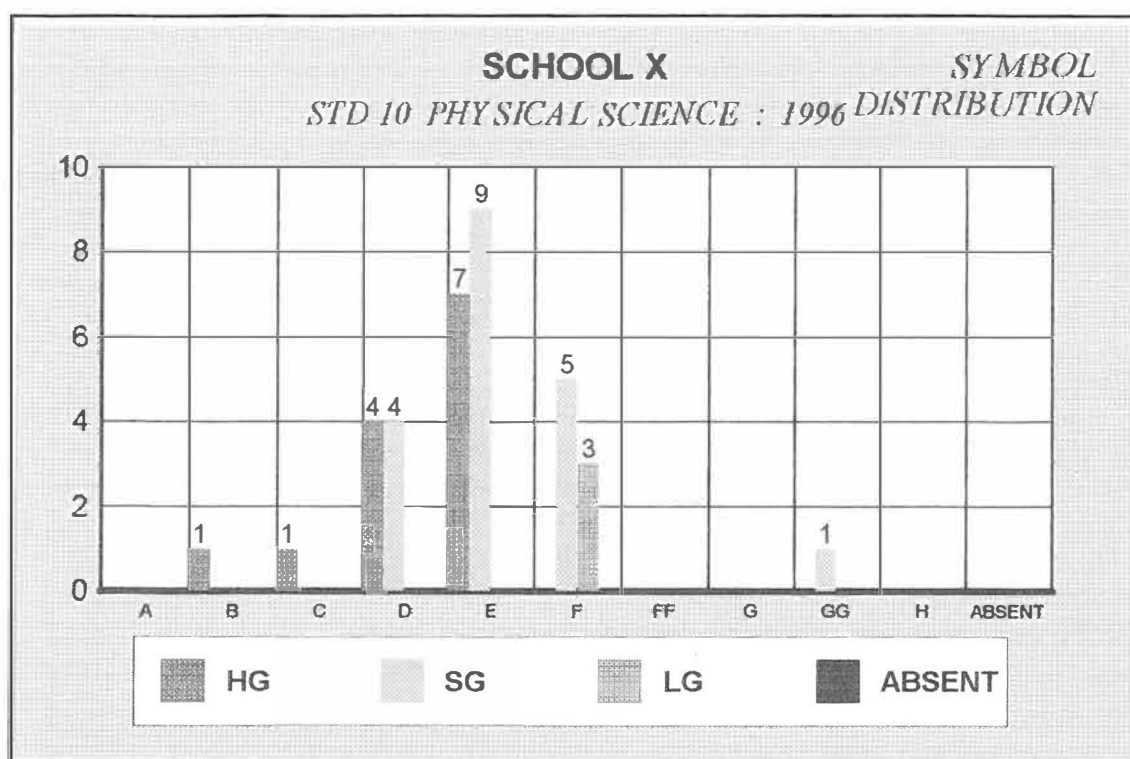


Figure 1 : 1996 MATRICULATION RESULTS - SCHOOL X

This trend is also prevalent within the African and Non-African groups. Of the 144 pupils, 35 wrote Physical Science representing a school population of 24% . The results obtained in Physical Science shows that 34 pupils passed overall in all grades with only one failure thus obtaining a pass rate of 97%. The different symbols obtained by Physical Science pupils for the different grades appear in Figure 2 on page 52.

SCHOOL Y

School Y obtained an overall pass rate of 65% with 130 pupils entered for the examinations. The different results obtained are shown in Figure 3 on page 53. From figure 3, 35 pupils gained exemptions, i.e. 27% obtained university entrance passes, whilst 50 pupils (38%) obtained just a senior certificate pass. The remaining 35% consisted of 38 failures and 7 absentees.



**Figure 2 : SYMBOL DISTRIBUTION - PHYSICAL SCIENCE
SCHOOL X**

The gender and race categorisation for School Y appears in appendix XIIa. This school entered 59 male and 71 female pupils and when combined with the overall pass rates obtained according to appendix XIIb, 35 (59%) of males passed whilst 50 (70%) females passed. Thus more females passed due to them being more in number. Again a similar trend to that obtained for School X within the African and Non-African groups occurred. Nineteen of the 130 pupils that wrote matric, i.e. 15% of pupils did Physical Science. Of these, only 13 passed representing a subject pass rate of 93% with 1 failure and 5 absentees. The various symbols obtained on the different grades is represented in Figure 4 on page 53.

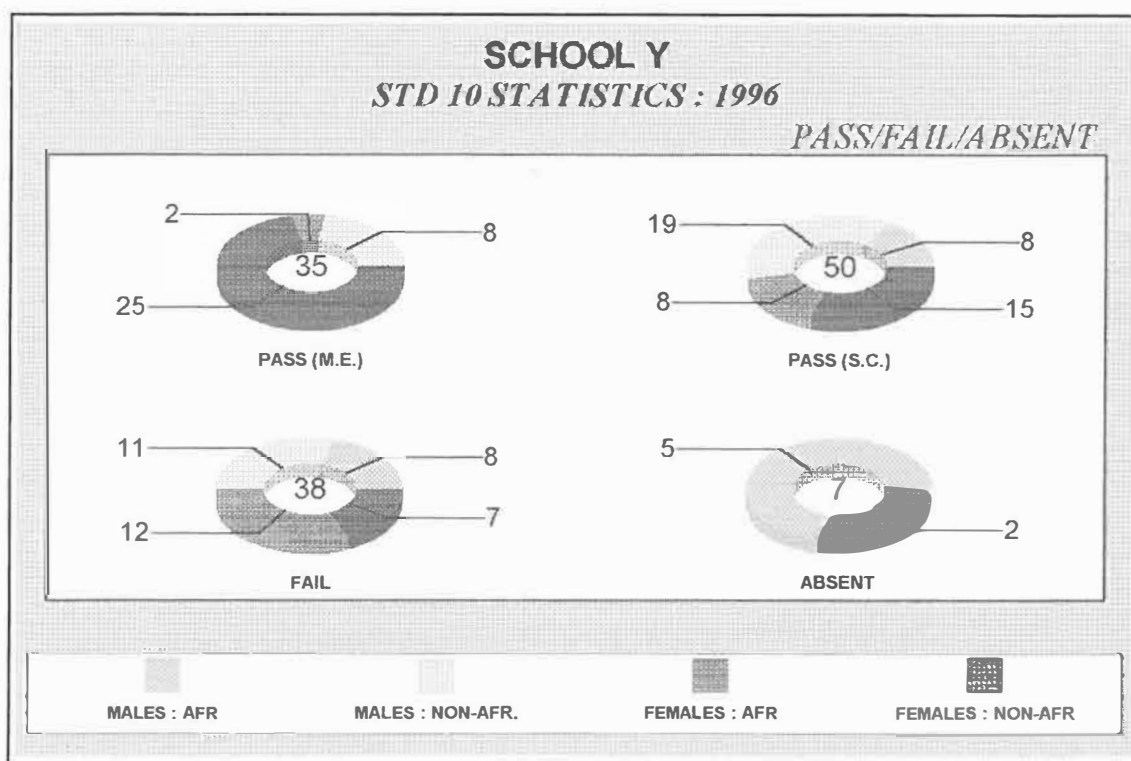
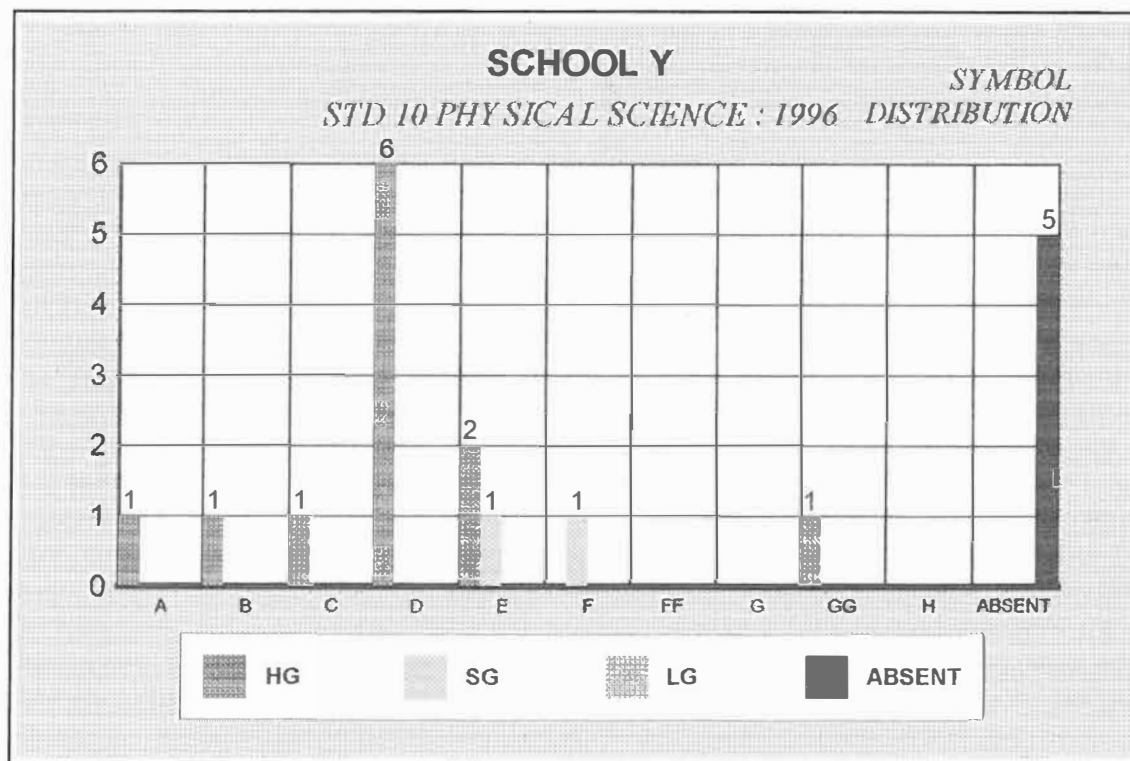


Figure 3 : 1996 MATRICULATION RESULTS - SCHOOL Y

Figure 4 : SYMBOL DISTRIBUTION - PHYSICAL SCIENCE
SCHOOL Y

SCHOOL Z

Of the three schools, Z produced the worst matriculation pass rate for 1996 as only 123 pupils out of 207 passed representing a pass rate of 59%. Data contained in Figure 5 on page 55 reveals that 86 pupils obtained university entrances (41%), 37 obtained senior passes (18%) and the remaining 41% consisted of 78 failures and 6 absentees. Although School Z produced more exemption pupils this must be seen in light of the larger population of students when compared to the other two schools. For the same reason the school also had a greater number of failures. The gender and race distribution appears in appendix XIIIa. School Z entered 114 males and 93 females for the 1996 examinations but when comparing their overall pass rates (appendix XIIIb), 68 females (73%) passed compared to 55 males (representing 48%). Yet again the African and Non-African group showed the same trend. School Z entered 77 pupils in Physical Science, comprising 37% of pupils writing matric for 1996. Fifty-eight pupils passed Physical Science (76%) whilst 18 failed and 1 pupil was absent. The symbol distribution for Physical Science pupils in the different grades appears in Figure 6 on page 55.

Table 8 summarises the pass rates of each school involved in this research, compared to the provincial pass rates.

TABLE 8 : COMPARATIVE PASS RATES

	PROVINCIAL	SCHOOL X	SCHOOL Y	SCHOOL Z
OVERALL	61,7%	70%	65%	59%
FEMALES	58%	89%	70%	73%
MALES	66%	55%	59%	48%
EXEMPTIONS	23,1%	34%	27%	41%
SENIOR CERTIFICATES	38,6%	36%	38%	18%
PHYSICAL SCIENCE	40,0%	97%	93%	76%

From table 8, schools X and Y performed above the provincial pass rates,

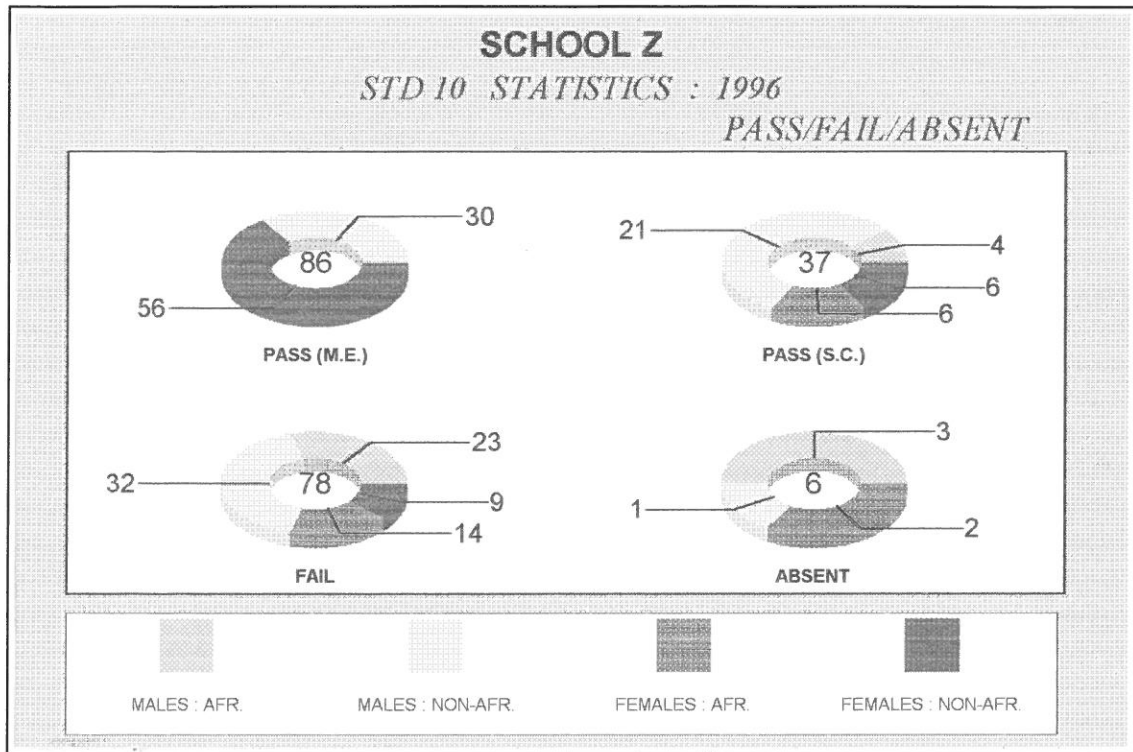
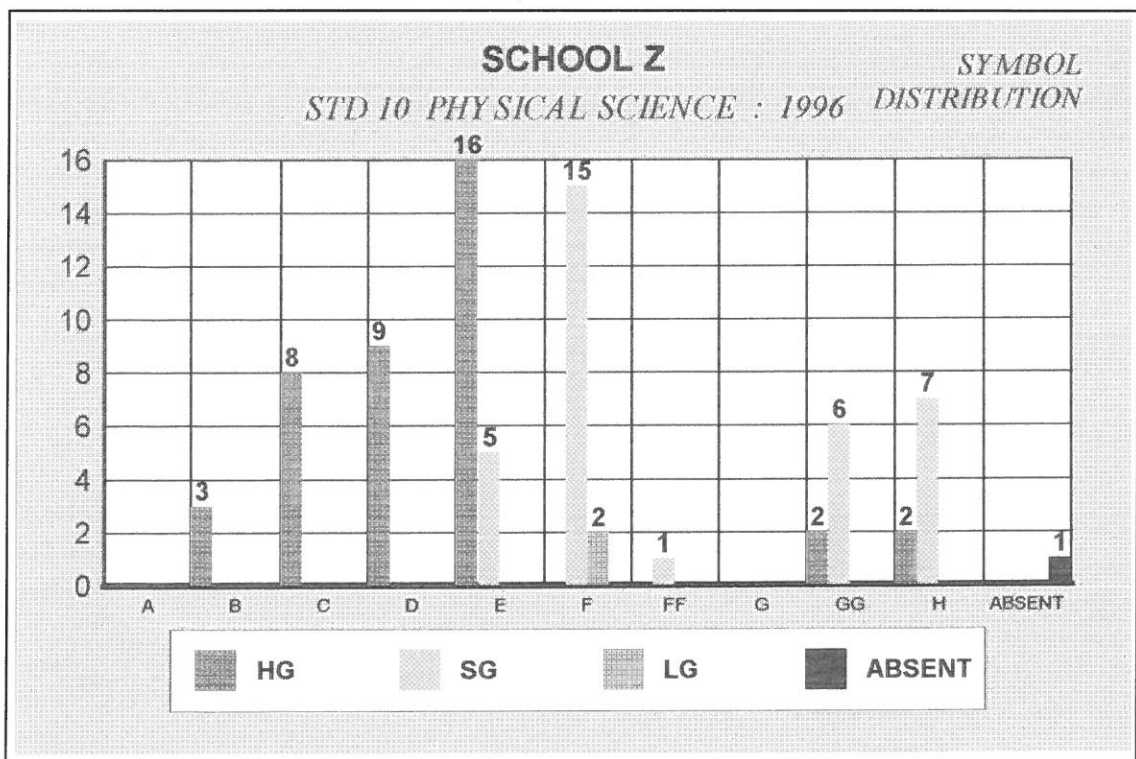


Figure 5 : 1996 MATRICULATION RESULTS - SCHOOL Z

Figure 6 : SYMBOL DISTRIBUTION - PHYSICAL SCIENCE
SCHOOL Z

whilst school Z performed below the overall provincial pass rate of 61,7%. The schools X and Y, therefore could be regarded as "high" achieving schools within KZN. It is hoped that some explanation could be offered for the poor performance of school Z from the data gathered. These three schools performed better provincially in two other areas, viz. female pass rates and passes with exemptions. Although both schools X and Z had more male candidates entered for the examinations, their female candidates performed better than their male counterparts. School Z obtained the highest passes with exemptions amongst the three research schools despite performing the worst of the three schools overall. All three schools showed poorer performance of male candidates in the examinations than that achieved provincially. Although the data for schools X, Y and Z do not conform to the provincial statistics in terms of success between male and female candidates, they do support the notion that females achieve better academic results than males as stated by O'Brien (1994). What is of greater significance in terms of this research is that these three schools performed exceptionally higher than the provincial pass rate for physical science, with school X recording a pass rate of nearly 100% down to school Z with a 76% pass rate in physical science. This research will provide some of the answers as to why these schools were "successful" as well as what was responsible for the differences between them.

4.1.2. Teacher Data

Prior to interviewing each teacher, data regarding the teacher's qualification and experience was obtained as well as membership to professional organisations and involvement in Physical Science. The abbreviations used in table 9 on page 57 represent the following:

QUAL ACAD : Academic qualifications

QUAL PROF : Professional qualifications

TE : Total teaching experience

PTE : Physical Science teaching experience

STD 10 : Experience as a Std 10 Phy.Sc. teacher

SUB EXP : Experience as a sub-examiner

PROF M/SHIP : Membership of a professional body

SUBJ INVOL : Involvement in Subject area

This was the data obtained :

TABLE 9 : TEACHER DATA

TEACHER	QUAL ACAD	QUAL PROF	TE	PTE	STD 10	SUB EXP	PROF M/SHIP	SUBJ INVOL
TX FEMALE	MATRIC	B.PAED B.ED	16	16	12	4	APEK	EXAM; H.I.T.
TY MALE	B.A	UDE B.ED	16	16	16	6	KASTE APEK	R.CHR; SC. FAIR; QUIZ.
TZ FEMALE	B.SC (HONS)	H.ED B.ED	5	5	2	0	SADTU	SC. FAIR.

Teacher X has been involved as an examiner for regional papers as well as How I Teach (H.I.T) series of workshops presented in her region.

Teacher Y was a Chairperson for the regional subject committee; arranged regional science quiz for std 9 pupils; held science fair and exhibition for pupils.

Teacher Z was the press liaison officer for the science fair in her region.

4.1.3. Pupil Data

The initial pupil data obtained concerned their reason for choosing Physical Science; their present field of study and reason for this choice. The data obtained for each school appears in Tables 10, 11 and 12 for schools X, Y and Z respectively.

For school X (Table 10), pupil X1 had no choice when it came to Physical Science as she wanted to do Art and the complete course was only available with Physical Science. Similarly, pupils X5 and X6 wanted to do Technika

Electronics but this was only offered with Physical Science. Pupils X2 and X4 chose Physical Science because other members in the family did it before, thus illustrating the point that families attach a certain status to Physical Science and therefore influence other members to choose it. The only pupil that chose Physical Science purposefully was pupil X3. These choice decisions show up when one examines what the pupils are presently doing or studying, as shown in Table 10 on page 58. Again only pupil X3 seems to be utilising Physical Science beyond matriculation level, although pupils X1 and X4 make slight use of it. For school Y, according to Table 11 on page 59 pupils Y1, Y2, Y4 and Y5 chose Physical Science because they wanted to pursue studies that required a knowledge of Physical Science. Pupil Y3 kept his options open by doing a subject set that included accounting.

TABLE 10 : PUPIL DATA - SCHOOL X

PUPIL	CHOICE OF PHY.SC	INTENDED STUDY	PRESENTLY STUDYING	REASON FOR CHOICE OF STUDY
X1 F	had no choice	art or computer field	occupational therapy (Medunsa)	interested in field
X2 M	family tradition	something in medical field or science	B.Comm. (UND)	likes the commerce field
X3 F	necessary to do medicine	medicine	chemical engineering (MLSTC)	unhappy with results
X4 M	family tradition	something in electronics	computer engineering (COMPUTEK)	kept to original choice
X5 M	had no choice	motor mechanics	working scanning clerk (PORTNET)	failed matric
X6 M	had no choice	architect	working scanning clerk (PORTNET)	failed matric

M = MALE ; F = FEMALE

Thus he opted for B.Comm. as he felt that he had a flair for accounting. Pupil Y6 did not choose Physical Science for any real purpose as she merely did

what was popular. Further she had no intention of studying beyond matric as she was not financially well off. In fact she opted to work in order to look after the family's financial needs. In the case of pupil Y6, the effect of SES certainly put paid to any possible ambitions that she might have had.

TABLE 11 : PUPIL DATA - SCHOOL Y

PUPIL	CHOICE OF PHY.SC	INTENDED STUDY	PRESENTLY STUDYING	REASON FOR CHOICE OF STUDY
Y1 M	interested in science field	anything in science	information technology (MLSTC)	fee reduction; bursary
Y2 F	interested in science field	health sciences	B. Comm. (UDW)	unhappy with science results
Y3 M	wanted an open choice	commerce field	B. Comm. (UND)	likes accounting
Y4 M	necessary for medicine	medicine or B. Comm.	biotechnology (MLSTC)	couldn't get acceptance elsewhere
Y5 F	likes to work in a laboratory	B.Sc.	financial information systems (MLSTC)	unhappy with science results
Y6 F	chose what friends were doing	no ambition	working part-time clerk	support family

M = MALE ; F = FEMALE

The only pupil that is utilising some knowledge of Physical Science in his present studies is pupil Y4. Pupil Y1 would have done something in the science field had his family's financial position allowed him to do so. He ended up doing Information Technology at M.L. Sultan Technical College (MLSTC), because the institution offered him a 75% reduction in fees for having an "A" aggregate and also he obtained a bursary for the remaining 25%. Pupils Y2 and Y5 did not study science-related courses as they were unhappy with their results in science. Pupil Y4 did not get accepted for medicine or B.Comm. thus he chose Biotechnology.

From Table 12 on page 60, all of pupils Z1, Z2, Z3 and Z6 chose Physical

Science because they were interested in science or wanted to pursue studies in science beyond matric level.

TABLE 12 : PUPIL DATA - SCHOOL Z

PUPIL	CHOICE OF PHY.SC.	INTENDED STUDY	PRESENTLY STUDYING	REASON FOR CHOICE OF STUDY
Z1 M	interested in science	medicine or dentistry	B.Sc. (WITS)	redirected towards medicine
Z2 F	medicine	medicine	B.Comm. (UND)	unhappy with science results
Z3 F	health sciences	medicine	pharmacy (WITS)	could not get into medicine
Z4 M	no choice	architect	computer software	keeping up with technology
Z5 M	likes to work practically	electronics	electronics (CATO-MANOR TECH)	practically inclined
Z6 F	liked science	dentistry or chemistry	working as a salesperson	failed matric

M = MALE ; F = FEMALE

Pupil Z4 had no choice as he had his mind set on architecture, therefore chose Technical Drawing, but this was only offered with Physical Science as one of the other subjects. Pupil Z5 on the other hand preferred subjects with a practical component to it hence opted for Physical Science. Pupils Z1 and Z3 are presently studying aspects of Physical Science at tertiary level, whilst pupil Z5 may be using a small amount of learnings from Physical Science in his study of electronics. Pupil Z2 gave up on her plans to study medicine as she was extremely disappointed with her results, thus chose to do a B.Comm. instead. Pupil Z1 still wants to do medicine therefore he has tuned himself to perform extremely well in order to get accepted into medicine. Although pupils Z4 and Z5 have failed matric, they have not given up on studying or pursuing a career.

The final results obtained by all pupils in this research is shown in appendix XIV, which shows only the symbols obtained in subjects excluding the languages, for the November 1996 Matriculation examinations. Other important pupil data collected were their number of days absent, Std 9 results, expected results (teacher's) and expected results (pupil's). This appears as appendix XV. The pupils number of days of absence will be discussed under disruptions at school and their expected results together with the teacher's expectations will be discussed under pupil performance.

4.2. PERCEPTIONS OF PUPILS, TEACHERS, EXAMINER AND SUB-EXAMINERS

The interviews conducted with pupils, teachers, examiner and sub-examiners produced a large number of responses for the various questions posed during the interviews. The data in coded form (see codes - appendix X) will be presented with a detailed analysis within a structured framework according to the following:

- a. teacher qualifications
- b. resources
- c. language
- d. examinations
- e. disruptions at school
- f. parental involvement
- g. pupil performance

4.2.1. Teacher Qualifications

For each school, responses to questions 1.1; 1.1.1; 1.1.2; 1.1.3 and 1.2 of the pupil interview schedule were used for analysis and discussion. This data appears in Table 13 on page 62.

The response to question 1.1, shows that all pupils interviewed were in favour of qualified teachers. Pupil X1 added that the teacher's qualification must

enable him/her to teach beyond the textbook level.

TABLE 13 : PUPILS' PERCEPTIONS - TEACHER QUALIFICATIONS

PUPILS	Q U E S T I O N S				
	1.1	1.1.1	1.1.2	1.1.3	1.2
X1	1	5	7 ; 10	19	26
X2	1	5	7 ; 10	14	23
X3	1	5	7 ; 10	14	14 ; 19 ; 21
X4	1	2	7 ; 10	14	21
X5	1	2	7 ; 9	14	23
X6	1	2	7 ; 10	14	23
Y1	1	2	7 ; 10	15	21
Y2	1	5	7 ; 10	14	21
Y3	1	5	7 ; 10	7 ; 17	21
Y4	1	2	7 ; 14	14	21
Y5	1	5	7 ; 14	14	21
Y6	1	5	7 ; 14	14 ; 19	21
Z1	1	3	7 ; 10	14	22
Z2	1	4	7 ; 9 ; 13	13 ; 17	22
Z3	1	3	7 ; 9	15 ; 20	27
Z4	1	2	7 ; 10 ; 14	10 ; 14	21
Z5	1	4	7 ; 14	15	26 ; 27
Z6	1	5	7 ; 10	14	21

CODES : 1 = yes ; 2 = diploma/degree at teaching institution (with 1st year courses) ; 3 = B. Paed (with 2nd and 3rd year courses) ; 4 = degree with internship (1 year minimum) ; 5 = degree with coverage of school syllabus ; 7 = beyond matric (1st or 2nd year courses) ; 9 = skills will come with experience ; 10 = communication skills and class management ; 13 = intensive 1 year internship ; 14 = teaching styles and techniques ; 15 = academic qualifications matter if teacher is motivated ; 17 = read widely ; 19 = promote healthy teacher-pupil relationship ; 20 = career guidance ; 21 = positive influence ; 22 = negative influence ; 23 = no influence ; 26 = undecided as teacher's qualification and experience, unknown to pupils ; 27 = qualification - no, experience - yes.

QUESTIONS

- 1.1. Do you think that it is important to have qualified teachers to teach std 10 Physical Science ?
- 1.1.1. What minimum qualifications should be attained ?

1.1.2. Academic ? Professional qualifications ?

1.1.3. For improved academic performance ?

1.2. Has your teacher's qualifications and experience had any impact on your performance in Physical Science ?
Elaborate.

This was also confirmed by pupil X3 who stated that sometimes pupils ask questions beyond the textbook, hence a teacher must have reasonable qualifications to answer such questions. Both pupils X5 and X6 agreed that a teacher must also have a sound knowledge of practical work and be able to get pupils involved in practical aspects.

The teachers' response to the same question 1.1 above, appears in table 14 below. All three teachers also felt that qualified teachers are indeed important for teaching physical science.

TABLE 14 : TEACHERS' PERCEPTIONS - TEACHER QUALIFICATIONS

TEACHERS	Q U E S T I O N S				
	1.1	1.1.1	1.1.2	1.1.3	1.2.1
TX	1	5	6; 9; 11	18	23; 24
TY	1	2	7; 12	12; 15; 16; 17	21
TZ	1	2	8; 9; 11; 13	12; 15; 17	14; 21; 25

CODES : 6 = matric only ; 8 = full degree (B.Sc) ; 11 = coping strategies ; 12 = participation in inset/workshops, etc. ; 16 = join/membership to a professional organisation ; 18 = not much (up to the pupils) ; 24 = no influence, but how one teaches has a positive influence ; 25 = gender influence.

(other codes as per table 13)

For question 1.1.1, from Table 13, high achievers X1 to X3, preferred more content beyond school Physical Science, whereas the low achievers were satisfied with just std 8, 9 and 10 content of Physical Science. Pupils Y2, Y3, Y5 and Y6 preferred teachers with a degree covering the physical science school syllabus. Pupil Y6 added that a :

"Teacher needs to go far beyond textbook knowledge and also present other approaches to understanding concepts, solving problems, etc. One has to know more since pupils have an enquiring mind and they will always challenge the teacher."

Pupils Y1 and Y4 felt that a degree or diploma covering at least first year university courses in Mathematics, Physics and Chemistry, was sufficient. Pupils Z1 and Z3 felt that a B. Paed (Science) degree with a major either in Physics or Chemistry was essential. An interesting newcomer to pupils responses to 1.1.1 came from pupils Z2 and Z5 who agreed that a degree was not enough. Instead a teacher must complete a 1 year internship at a secondary school before being plunged into the classroom full time. This they said, was in keeping with the other professions such as medicine and law. Pupil Z4 preferred a degree or diploma with at least 1st year university courses, whilst Z6 preferred the teacher having a degree with thorough knowledge of the school syllabus.

According to table 14, TX preferred a degree which incorporated the school Physical Science syllabus as part of the courses. Teachers TY and TZ stated that a degree or diploma obtained at a recognised teaching institution with at least 1st year courses in Mathematics, Physics and Chemistry, would be the minimum.

Question 1.1.2, revealed that all pupils of school X felt that minimum academic qualifications should be a study beyond matric at least up to 1st or 2nd year courses. But this had to be coupled with a professional component especially dealing with communication skills and classroom management, a view held by all pupils of this school except X5, who felt that such skills would come with experience. The high achievers of school Y, (Y1, Y2 and Y3) preferred additional communication and classroom management skills, whereas the low achievers (Y4, Y5 and Y6) showed a liking for teaching styles and techniques. The following quotations were obtained:

- Y4 : "The teacher should be able to encourage the weaker pupils and provide enrichment."
- Y5 : "The teacher must be able to make pupils feel comfortable, i.e. establish the right learning environment."
- Y6 : "The teacher must serve as a role model and provide career guidance to pupils."

Three pupils of school Z added that communication and classroom management skills were important, whilst two other pupils said that such skills would come with experience. Pupils Z4 and Z5 added that teaching styles and techniques such as integrating theory with practical and providing career guidance to pupils were two of the factors that they liked. Pupil Z2 reaffirmed her stance on the 1 year internship as a must for a teacher to develop professionally.

From table 14, TX felt that a teacher should not proceed beyond matric in terms of pure academic studies such as a B.Sc., rather, there should be an emphasis on professional aspects such as coping strategies to handle classroom problems, while other teaching skills will develop with experience. Thus a teacher with a degree from a teacher college would fit this category. TY felt that a teacher should go beyond matric in terms of academic qualifications at least with 1st or 2nd year courses. Professionally, the teacher must participate in INSET; workshops; etc. in order to keep updated with subject matter and classroom management skills. This would be what one would expect in a B. Paed degree. TZ stated that a science teacher must have a full degree eg. a B.Sc. as an academic qualification not only to teach, but to enter other vocations if teaching does not satisfy the individual. For professional qualifications, at least coping skills should be part of a teachers armament. She also proposed a full years internship (paid) before certifying a teacher. This she felt is what lacks in the present system, eg. "3rd year college students that came to do practice teaching at school Z, could not cope with pupil problems because (TZ felt that) the college curriculum focused mainly on content rather than on school-based teaching practice". What is interesting here is that Teachers X, Y and Z, described qualifications that are similar to

their own, thus using their experience to decide.

For question 1.1.3, pupils of school X felt that this did not depend on qualifications, rather it was more to do with the teaching styles and techniques employed by the teacher. This was not shared by pupil X1 who felt that a teacher should promote a healthy teacher-pupil relationship. Here are some quotations extracted from the interviews with pupils:

X2 : "The teacher should avoid being the dominant figure in the class."

X4 : "The teacher should help pupils develop an easier method to solve problems."

X6 : "The teacher should integrate theory with practical work all the time."

Pupils of school Y felt that improved pupil performance would certainly occur if the teacher varies his/her teaching styles and techniques. This was confirmed by 4 of the 6 pupils at school Y. Pupil Y1 felt that a qualified and experienced teacher is capable of covering the subject matter to a greater depth hence impacting positively on pupils. Pupil Y3 feels that a teacher should read extensively and also study beyond matric Physical Science in Science courses.

For school Z, the popular vote was teacher style and techniques chosen by pupils Z1, Z4 and Z6. Pupil Z1 emphasised that a teacher must encourage pupils to develop problem solving skills, whilst pupil Z4 suggested that a teacher should update his/her knowledge on a continuous basis. The second most popular choice was made by pupils Z3 and Z5 and that is, a teacher should study for the sake of his pupils to improve his academic qualifications. Pupil Z2 believes that the right formula would be the 1 year internship and extensive reading. Only pupil Z4 felt that communicating and classroom management skills would encourage pupils to do better. Pupil Z3 felt that a teacher would be a positive influence on pupil performance if he/she provided career guidance.

The teachers' views produced the following : TX responded by saying that not much can be done really by a teacher in terms of qualifications, but

improvement of pupil performance is more up to the pupils, because the teacher can only do up to a certain amount. TY felt that a teacher should participate in INSET; workshops; etc. in order to help pupils improve. The teacher should also read widely and subscribe to various science journals. If the teacher is motivated enough, he/she could try to improve academically. Teacher TZ also held the same views as TY.

The final question 1.2, revealed that only pupils X3 and X4 in school X felt that there was a positive influence in this regard, with X3 stating that

"...the teacher was a good role model to me ... she created a comfortable climate and was approachable."

Pupil X3 also added that the teacher's teaching style and technique as well as a healthy teacher-pupil relationship contributed to this positive impact. Pupil X4 felt that

"...her experience made me feel confident with what she taught."

Pupil X1 was undecided, since she was unaware of the teacher's qualifications and experience or this never showed up in her teaching. All pupils of school Y agreed that their teacher's qualifications certainly impacted positively on them. As an example, pupil Y3 confirmed that the teacher was able to use his own knowledge and experience to make scientific concepts more real. Regarding teacher's qualifications and experience, both high achieving pupils Z1 and Z2 stated that this impacted negatively on their performance. Pupil Z1 qualified this by stating that the teacher's Std 10 experience as well as her experience in the classroom was insufficient as the teacher was more academically inclined. Z2 felt that due to teacher's inexperience, the bare minimum was taught, which did impact negatively. On the other side of the coin, pupils Z4 and Z6 saw the teacher's influence in a positive light. Pupils Z3 and Z5 felt that qualifications did not impact but experience did. Pupil Z3

said that due to the teacher's inexperience, the bare minimum was covered. This pupil actually learnt more through a tutor. Pupil Z5 felt that the teacher's inexperience was evident when she frequently consulted the other science teacher at school, but Z5 continued by stating that he was unsure of the real influence the teacher might have had as he was unaware of the teacher's qualifications and experience.

Did the qualifications and experience of the teachers X, Y and Z, have any effect on pupils performance ? Teacher X felt that her qualifications and experience had no influence on pupils' performance, but how she taught may have had a positive influence. The non influence concurs with perceptions held by pupils X2, X5 and X6. Pupil X3 held the same views as TX, regarding her teaching that could have impacted positively, but added that her experience was also valuable. A fifth confirmation of TX's positive contribution as a direct result of qualifications and experience, was provided by pupil X4. Only pupil X1 was undecided on this issue. Teacher Y felt that his own qualifications and experience had given him sufficient confidence to interact with his pupils e.g. when it came to electrical and electronic content, the teacher was able to provide more depth. This teacher was well supported in this respect as all pupils interviewed, stated without a doubt, that their performance would have been worse, had they had some other teacher. Teacher Z felt that not only did her qualifications, influence pupils positively, it was also her teaching style - especially gender bias, that contributed as well. She stated

... "pupils want to know what you studied... they get impressed and want to emulate you in many ways".

She also believed that being a female teacher of science, it tends to also make female pupils want to succeed in the subject. This did not come out the same when compared to pupils' responses. The two pupils that were positively influenced, i.e. Z4 - male and Z6 - female. The other four pupils Z1, Z5 -

male and Z2, Z3 - female all felt the teacher's inexperience impacted negatively on their performance.

The examiner(EXM), sub-examiner-physics(SEP) and sub-examiner-chemistry(SEC) response to the question, **do you think that results were poor due to underqualified teachers or inexperienced teachers or both ?**, revealed the following :

All three people, could not really tell how teachers qualifications or experience were responsible for poor results. However, SEP felt that the poor results were due to some teachers being unaware of what to teach eg. frictional forces. Other SEP's were honest enough to admit to this. SEC echoed the same as SEP. The EXM also felt that what the teacher did in the classroom outweighed whatever his or her qualifications and experience might otherwise suggest.

From the discussion on teacher qualifications, where the teachers had more experience, viz. TX and TY, they were able to use such experience and their special teaching styles to enhance pupil performance. The least experienced teacher, TZ was seen by her pupils as a negative influence on their performance. Although all teachers were suitably qualified to teach matriculants, there was a difference in pupil performance for each of the schools. Teacher experience rather than qualifications did influence pupil performance. The conclusion drawn here is in keeping with Naidoo and Khumalo (1996:9), i.e. teachers that are university trained, are capable of producing better performance of pupils. The notion according to Saha (1983) that male teachers are more successful in science teaching, was not researched in this dissertation as the sample was too small to draw any conclusions. Incidentally, school X achieved the best results and their science teacher was female. Gudmundsdottir (1990), conceded that teacher attitude does have an effect on pupil performance. This was evident for school Z where the teacher placed female pupils on a high pedestal but did not like teaching a class of all

boys. This resulted in the boys disliking science at the school, yet the girls looked up to the teacher as a role model.

4.2.2. Resources

Data taken for analysis were the responses to questions 2.1; 2.1.1; 2.2; 2.2.1 and 2.3 of the pupil interview schedule.

According to Table 15, data for question 2.1, pupils perceived that nothing special was done at school X. Pupils X3 and X4 added that the teacher did adopt a special style of teaching, but according to pupil X3, the pupils in class did not pay much attention to her. Pupil X4 stated that the teacher's enthusiasm enabled earlier completion of the syllabus hence providing pupils with more time for revision. Examining the combined responses of each pupil to questions 2.1 and 2.1.1, pupils X1, X5 and X6 lost interest in science as they found their science lesson not very stimulating. Pupil X2 who also claimed that the lessons were not very stimulating, felt that this did not have any effect on his own performance. Pupils X3 and X4 again responded in a manner that gave credit to the teacher's style of teaching which they felt did impact positively on their performance, although very slightly.

With regard to the use of resources in order to enhance Physical Science lessons, pupils at school Y provided a variety of responses. Five pupils with the exception of Y3, said that the teacher's use of humour and organisation of science fairs / exhibitions gave them some relief from ordinary teaching. Four of the pupils, except Y1 and Y6, also added that the teacher used quizzes and crosswords to explore some science concepts. Pupil Y3 was the only pupil that said the teacher used Physical Science videos for some lessons. Pupil Y6 said that the teacher used his own experience as content for lessons thus making pupils feel that he was human! All pupils thus felt that the various techniques or teaching style had a positive impact on their learning, as seen from their response to question 2.1.1.

TABLE 15 : PUPILS' PERCEPTIONS - RESOURCES

PUPILS	Q U E S T I O N S				
	2.1	2.1.1	2.2	2.2.1	2.3
X1	49	55	58	61	64 ; 65
X2	49	56	38 ; 58	62	64 ; 65
X3	49 ; 50	50	58	62	64 ; 66
X4	49 ; 50	50	38	56	67 ; 68
X5	49	55	38 ; 58	62	67
X6	49	55	38	62	67
Y1	51 ; 52	50	38 ; 39	62	67 ; 68 ; 69
Y2	51 ; 52 ; 53	50	58	63	64 ; 66
Y3	37 ; 53	50	38	63	67 ; 68 ; 69
Y4	51 ; 52 ; 53	50	38	63	67 ; 68 ; 69
Y5	51 ; 52 ; 53	50	38	63	67 ; 68 ; 69
Y6	41 ; 51 ; 52	50	58	62	67 ; 69
Z1	49 ; 54	57	38 ; 58 ; 59	62	64 ; 65
Z2	49 ; 54	56	38 ; 58	62	64 ; 65
Z3	49	56	58	56	64 ; 65
Z4	54	57	60	56	67
Z5	49 ; 54	55	38 ; 58	55 ; 63	67
Z6	54	55	38	56	67

CODES : 37 = Star school/media instruction ; 38 = laboratory - due to lack of resources ; 39 = due to shortage of time ; 41 = teacher's own experience ; 49 = nothing special ; 50 = teacher style ; 51 = humour ; 52 = science fairs/exhibitions ; 53 = quizzes/crosswords ; 54 = books, worksheets and examination papers ; 55 = lost interest ; 56 = no effect ; 57 = a small positive influence ; 58 = broken equipment ; 59 = lack of practical work - too much theory ; 60 = shortage of textbooks ; 61 = did practical work like following a recipe ; 62 = developed group skills but no laboratory skills ; 63 = results were make belief ; 64 = made use of tutor ; 65 = tutor (+ve) influence ; 66 = tutor no influence ; 67 = did not make use of tutor ; 68 = attended revision programme ; 69 = helped other pupils/peer teaching.

QUESTIONS

2.1. What resources were used to enhance your Physical Science lessons ?

2.1.1. How did use of these resources influence your performance ?

2.2. What resources were lacking ?

2.2.1. Did the lack of these resources influence your performance ?

2.3. Have you made use of other teachers or tutors in Physical Science ? Did it help ?

For school Z, from the response to Q2.1, five pupils, with the exception of Z3, felt that their teacher's use of other books, worksheets and past-exam papers were an attempt by the teacher to add excitement to an otherwise unexciting series of lessons in Physical Science. Pupils Z1, Z2 and Z5 felt that other than worksheets, books and past-examination papers, nothing special was done to enhance their lessons. Although pupil Z3 did not mention the books, etc., she agreed that nothing special was done. The pupils were split equally when required to respond to 2.1.1, with two pupils (Z1 and Z4) indicating that there was a slight positive influence. Pupils Z2 and Z3 felt that books, etc., had no effect on their performance, whilst Z5 and Z6 lost interest due to the lack of anything exciting in their science lessons.

The analysis on resources was based on response to questions 2.1; 2.1.1; 2.1.2; 2.2 and 4.8 of the teacher interview schedule. The data appears in Table 16, page 73.

Question 2.1 required teachers to state the **human and physical resources they have used to enhance their Physical Science lessons**. Teacher X did not consult or engage other teachers for her lessons. She made use of other textbooks and reference books to enrich pupils. She designed her own worksheets. She made use of the Science laboratory as well as the Technika Electronics Laboratory at school. This the pupils did not see as anything out of the ordinary, it was part of any normal teaching. Two pupils, X3 and X4 did, however, indicate that the teacher herself was a valuable resource as defined by the way she taught. Teacher Y did not refer to other teachers, as he was just as experienced as TX. He did make extensive use of reference books and journals. He also used a variety of teaching techniques. Pupils found his use of humour; exhibitions and fairs; and crosswords, quizzes, etc. very refreshing and stimulating as learning aids. These can be verified by

examining responses made by all pupils of School Y. Teacher Z made use of other reference and textbooks as well as worksheets and study material

TABLE 16 : TEACHERS' PERCEPTIONS - RESOURCES

TEACHER	Q U E S T I O N S			
	2.1	2.1.1	2.1.2	2.2
TX	28; 29; 30; 31; 32	37	30; 42	46; 47
TY	28; 29; 32; 33	36	29; 32; 40; 41	44; 45
TZ	29; 32; 34; 35	37; 38; 39	29; 35; 43	29; 43; 48

CODES : 28 = no use made of other teachers ; 29 = made use of other texts/references ; 30 = designs own worksheets ; 31 = uses facilities from other subject fields ; 32 = uses available laboratory facilities ; 33 = used department practical manual ; 34 = uses/refers to other staff members ; 35 = exchanged worksheets with other schools ; 36 = obsolete equipment ; 40 = department curriculum packages ; 42 = provide extra lesson ; 43 = examination papers (model C schools) ; 44 = as many appropriate resources as possible ; 45 = teacher exchange programme ; 46 = exposure to many problems - develop problem solving skills ; 47 = provide answers but no solutions ; 48 = providing access to information not easily available to pupils.

(other codes as per table 15)

QUESTIONS

- 2.1. What available resources (human and physical) have you used to enhance the teaching of Physical Science ?
- 2.1.1. What resources have you not used ? Elaborate.
- 2.1.2. Which resources have you used for better pupil performance and why ?
- 2.2. Which resources do you think a Physical Science teacher should utilise to achieve better academic performance of pupils ? Why ?

Q4.8	a	b,c,d	e	f
TX	73	73	70	73
TY	72	72	70	72
TZ	71	73	71	71

CODES : 70 = theory only ; 71 = theory and practical demonstration ; 72 = theory, demonstration and pupil practical ; 73 = theory and pupil practical.

QUESTIONS

- 4.8. How were the following practical work accomplished during the std 9 and 10 year ?
- testing for chloride, sulphate and carbonate ions.
 - reducing action of H_2S
 - precipitation reactions of H_2S

- d. test for H_2S
- e. phase equilibrium of water
- f. Ohm's Law

exchanged with other schools. She did make use of the laboratory at times. She also roped in the expertise of the other science teacher during her teaching. Pupils did feel that at some times TZ did nothing special (Z1, Z2, Z3 and Z5) but three of the same four, except Z3, added that worksheets, notes and reference materials were used often. This was supported by Z4 and Z6.

Question 2.1.2, table 16, looked at resources that were used for better performance. Teacher X believes that her own designed worksheets coupled with extra lessons provided to pupils may have produced better performance. TX felt that a range of resources, such as books; practical work; curriculum packages; and teacher's own experience, were used to better pupil performances. TZ also tried to use books; examination papers and worksheets from other schools. This then extended into another question in the form of Q2.2, for which teacher X suggested that pupils be exposed to many problem situations in order to allow them to develop a problem solving strategy. To this she added that one must provide the pupil with the answers and not the solution ! Let them work out a strategy. TY felt that one could use as many appropriate resources as possible. He also would encourage a teacher exchange programme. Finally, TZ felt that use of other reading material; examination papers and providing access to information not easily available to pupils, could be utilised.

Question 2.2, table 15, dealt with the **lack of resources** and according to responses made by X2, X4, X5 and X6 there was a definite lack of laboratory equipment at school X. Pupils X2 and X5 went a step further by stating that even where laboratory equipment was available, it was either broken or in need of repair. This view was also expressed by pupils X1 and X3. Pupil X4 stated that with the large class size of 35 pupils, practical work was always

done in groups mainly to share the resources. This school was fortunate according to pupil X1, in that the poor state of electricity equipment was not a problem, as the school has an Electronics laboratory, which was used to successfully complete the electricity practicals. Question 2.2.1 examined the **influence which lack of resources mentioned in 2.2. had on pupil performance**. Four pupils, viz. X2, X3, X5 and X6 mentioned that due to the way in which laboratory work was done, they developed group skills rather than any practical or laboratory skills. Pupil X4 felt that the lack of laboratory equipment and even its poor condition had no effect on his performance. Pupil X1 felt that

"there was no in-depth discussion or opportunity to do experiments - we merely followed the practical worksheets like a recipe. We had no idea what to expect."

As far as the lack of resources go at school Y, four pupils felt that there was some lack when it came to the laboratory, more specifically, chemicals were ineffective due to age, as a result most chemistry practicals were not convincing. Pupils Y2 and Y6 added that some equipment was broken or in need of repair. Pupil Y1 added that even where there was sufficient apparatus to work with there was the importance of available time, i.e. having a double period set aside one day in the week for practicals did not work out when it came to disruptions or closure of school. The effect of this lack of resources is shown by responses to question 2.2.1 where two of the pupils agreed that they developed group skills rather than practical / laboratory skills, whilst the other four pupils felt that due to the poor state of chemicals, their results were make believe.

For school Z regarding lack of resources, four pupils each indicated that their laboratory did reflect a shortage of equipment, as well as some equipment was either broken or in need of repairs. Pupil Z1 also added that a general lack of practical work as an essential science resource prevailed at school Z. Pupil Z4 indicated that there was a shortage of textbooks as he did not have one to

work with. According to responses tabled for 2.2.1, the effect these lack of resources had on pupil performance ranged from no effect for pupils Z3, Z4 and Z6, to developing group skills rather than laboratory skills for pupils Z1 and Z2, and fabricating or make believe results for pupil Z5, who also lost interest in Physical Science.

For 2.1.1 of the teacher interview schedule, teachers X and Z did not use the learning channel on TV, but referred pupils to it. Teacher Y did not use the obsolete equipment lying around in the laboratory storeroom. This he believed needs to be removed by the education authorities and converted into useful resources. Teacher Z did admit to hardly using the Science laboratory due to lack of resources and time. At this stage if we draw a link between Q2.1.1 and Q4.8, we would be able to develop a better picture of the lack of laboratory facilities at each school. The position at school X indicates that other than practical e, practical work was done as pupil practicals implying that there was sufficient laboratory equipment to achieve this, even working in small groups. The exception here would have been practicals b, c and d, which required the use of the Kipp's apparatus, and only one was available at each school. There is a strong agreement as far as practical e goes at all schools. This practical was covered in theory only by schools and confirmed by all pupils. This does not mean that the equipment for this practical was not available. On the contrary, practical e could be done without any specialised equipment. (Practical e refers to the phase equilibrium of water, and is not elaborated as a practical in the syllabus - hence not done practically by majority of teachers.) At school Y, all practicals were achieved in the same way as school X. This was totally verified by examining pupils responses. For School Z, only practicals b, c and d were done as pupil practicals, but in groups. By the teacher's admission, the laboratory was not well resourced to handle large groups of students, so she hardly used the laboratory. This may have been misinterpreted by the pupils that there were resources. Pupil Z1 did say that they hardly went to the laboratory, so he couldn't say whether they had a shortage of equipment or not.

The final question pertaining to resources was 2.3. The three high achieving pupils X1, X2 and X3 were exposed to tuition and both X1 and X2 confirmed that their tutor definitely made a positive contribution to their understanding of Physical Science and therefore improved their performance. Pupil X3 on the other hand, felt that tuition did not influence her performance as the tutorial group was too large so it was difficult to get individualised attention. The low achieving pupils (X4, X5 and X6) did not make use of a tutor, but pupil X4 did attend a revision programme for matriculants held during the Michaelmas Holidays. These revision sessions did help pupil X4.

Question 2.3 on help obtained by tutors shows that only one pupil from school Y, i.e. Y2 got help from a tutor, but this did not help at all. The other five pupils did not obtain help from a tutor, instead they all got together and engaged in peer teaching with the "teacher" mainly being pupil Y1. The group as a whole benefitted from this peer teaching. Even though Y1 did most of the explaining, he indicated that he learnt a lot from the group in that those concepts that were unclear to him, were clarified by the group. With the exception of pupils Y2 and Y6, the others attended revision classes during their Michaelmas Holidays. They found that this was useful just prior to going into the examinations. Question 2.3 yielded a nice split between the high achieving group (Z1, Z2 and Z3) and the low achieving group (Z4, Z5 and Z6), where the high achievers sought help from tutors and found that this positively impacted on their personal performances. The low achievers did not make use of tutors although pupil Z5 did attend a large tutorial group but left within a few days as the tutor did work way ahead of what was being done at school.

The pupil response to an additional question i.e. Q4.9, appears as appendix XVI. This question required a response as to **how the practical work was conducted at school**. Practical a, dealing with testing for anions was done in theory and as a pupil practical at School X. At school Y, this practical was first demonstrated by the teacher with a discussion of theory and then as a

pupil practical. School Z only did this in theory. For practicals b, c and d, dealing with H_2S and its reactions, School X did the theory and teacher demonstrated practical. The same method was employed at School Z. At School Y the teacher used the same tactics as for practical a. Practical e, i.e. the phase equilibrium of water, was covered in theory only by Schools X, Y and Z. Practical f, dealt with Ohm's Law. School X did this in theory and as a pupil practical. School Y did the theory and teacher demonstration followed by pupil practical. School Z only did Ohm's Law in theory.

The examiner's and two sub-examiners' response to question 6 i.e. **did the performance of pupils reflect lack of resources at schools ?** revealed the following :

SEP: felt that poor answering of electricity questions reflected lack of exposure to practical equipment at school.

SEC: Although many disadvantaged schools did not do practical work, pupils were still able to explain results from theory.

EXM: felt that poor pupil performance in the rural areas, reflected lack of textbooks; lack of past exam papers and poor teaching.

All three schools, being ex-HOD schools, one would have expected them to be well resourced in terms of well-equipped laboratories; fresh stock of consumables; and sufficient textbooks. However, even before the GNU took over, the cash-strapped Education Department (ex-HOD), was unable to sustain and maintain school laboratories in a satisfactory condition. Furthermore, with plans to resource previously disadvantaged schools a priority in KZN, such schools will further degenerate into a museum showpiece with hardly any practical work being covered. The future looks bleak for these schools, and what is worse, many pupils from disadvantaged backgrounds are flocking for admission into these schools. Little do they realise that the situation in terms of laboratory resources will be worse than they expected it to be. Added to this the present Education Administration has shirked on its responsibility to provide free and compulsory education, by

requesting that parents foot the bill when it comes to running state schools. Although the lack of resources did not significantly affect pupils at the three research schools, the pupils certainly were short-changed in that their practical experience was limited. I have a suspicion that practical work was not done as a result of there being no examination of practical work. If this is the case, then I am afraid that Physical Science will lose its value as a practical subject. Furthermore, according to Kahn (1993:28), pupils will not be able to fully understand and perform scientific techniques.

The resources that were linked to positive impact on pupil achievement were:

- * use of field trips / excursions / quizzes / crosswords / science fairs / etc. beyond normal chalk and talk or worksheets (teacher dominated lessons).
- * teacher's vast experience as a resource on its own.
- * teaching style and techniques.
- * other books / worksheets / examination papers.
- * other teachers / tutors / pupils (peer teaching).
- * constructive revision programmes.

The negative influences were:

- * lack of laboratory equipment and consumables.
- * poor maintenance, servicing and repairs to broken equipment.
- * time-table constraints to do practical work and completion of syllabus.

4.2.3. Language

Table 17 on page 80 contains the responses to the two questions, viz. 3.1 and 3.1.1 as per pupil interview schedule.

Pupils of school X did not experience any problems as far as teacher's and pupils' use of language were concerned. The exception was pupil X2 who did experience some problems. Teacher X, according to pupil X2, used language

that was easy to understand, but at times spoke too fast. The pupil was scared to ask the teacher to slow down as he felt the teacher was dominant. Pupil X2 added that pupils' poor grasp of language resulted in the teacher slowing down lessons. This difficulty which X2 encountered, meant that syllabus coverage was slowed down but this did not affect pupil X2's performance. Since the other pupils of school X encountered no problems, there was no possibility of language interfering with their performance. This is clearly reflected in data for Q3.1.1. Upon examination of responses to questions 3.1 and 3.1.1 for Schools Y and Z, no problems were experienced with teacher's and pupils' use of language, therefore there was no effect on pupil performance.

TABLE 17 : PUPILS' PERCEPTIONS - LANGUAGE PROBLEMS

	SCHOOL X - PUPIL'S RESPONSES					
	X1	X2	X3	X4	X5	X6
3.1	74	75 ; 82	74	74	74	74
3.1.1	74	82	74	74	74	74
	SCHOOL Y - PUPIL'S RESPONSES					
	Y1	Y2	Y3	Y4	Y5	Y6
3.1	74	74	74	74	74	74
3.1.1	74	74	74	74	74	74
	SCHOOL Z - PUPIL'S RESPONSES					
	Z1	Z2	Z3	Z4	Z5	Z6
3.1	74	74	74	74	74	74
3.1.1	74	74	74	74	74 ; 82	74

CODES : 74 = no problems ; 75 = encountered problems - poor communication and understanding ; 82 = teacher slowed down lesson.

QUESTIONS

- 3.1. Was the teacher's use of language and that of other pupils in the science class easily understood by you ? Were you able to cope ? Were there any difficulties ?
- 3.1.1. Did the language difficulties of others impede your progress ? Elaborate.

Pupil Z5 did admit however that the teacher slowed down lessons at times to allow pupils to cope, but the work was completed in good time. Pupil Z1

added that the pupils that could possibly have had language difficulties, hardly spoke in class or were absent, therefore it was not easy assessing the problem.

Language certainly would not have been too problematic for the pupils, as they seem to have their own code as such, so that even though pupils from different cultural backgrounds and race groups were together in the classrooms, they understood each other and communicated with ease. However, the teachers did not see this in the same way as will be evident during the discussion of teachers' perceptions, the data for which appears in table 18 below.

Response to questions 3.1; 3.1.1 and 3.1.2 of the teacher interview schedule was taken for the analysis of language. The response required for Q 3.1 revealed that teacher Y encountered no problems with his pupils as there were only a few pupils. They communicated fairly well. Teachers X and Z did encounter problems with poor communication and understanding.

TABLE 18 : TEACHERS' PERCEPTIONS - LANGUAGE PROBLEMS

TEACHERS	Q U E S T I O N S		
	3.1	3.1.1	3.1.2
TX	75	79	82
TY	74	76; 77; 78	81; 82
TZ	75	76; 77; 78; 80	81; 82

CODES : 76 = bridging programme ; 77 = helped ; 78 = abandoned ; 79 = no special programme ; 80 = "study-buddy" programme ; 81 = affected pupils progress.

(other codes as per table 17)

QUESTIONS

- 3.1. Did you experience any difficulty in communicating with second language English speakers during your Physical Science lessons ? Elaborate.
- 3.1.1. How did you cope ? Did you adopt any special programme for these pupils ?
- 3.1.2. Did pupil language difficulties impede other pupils' progress ? Elaborate.

For the next question (3.1.1), data revealed that teacher X did not employ any

special programme as the pupils concerned had indicated that they understood. According to TX :

"It's hard to determine this way (by asking), that they don't understand. The only time you make out that they don't understand is when they write".

The teacher did however slow down her lessons to repeat herself so that pupils could understand. Teacher Y, had no problems with the 1996 pupils. He did experience problems with the 1997 pupils. He tried out a bridging programme which was helpful to the ESL pupils. This practice was abandoned due to the community labelling it as discriminatory and racist, yet the intentions of the teacher were sincere and pupils were benefitting. Teacher Z, also tried out similar bridging programme as TY, but the pupil turnout was poor. This programme was scheduled during the lunch breaks, but pupils were not interested. However, the teacher did not give up, as she used the concept of "study-buddy" while pupils were in class for science. The emphasis was that "to teach twice is to learn twice". The teacher taught the lesson first, then pupils got into groups with at least one competent English speaking pupil in each group to teach the group again. **How was all this affecting the other pupils ?** That was what Q3.1.2 was all about. At all three schools, the teachers felt that by slowing down their lessons, the other pupils seemed to be getting restless and bored. Teachers Y and Z felt that the language difficulties affected all pupils' progress. Pupils that encountered problems, had difficulty coping with concepts, etc, whilst those who had no problems, had to wait for the teacher to get on with the next section. When these teacher perceptions are compared to those of the pupils at each school, we see that the pupils did not really perceive the language difficulties as something that would have affected their progress.

The response of the examiner and two sub-examiners, to question 7, i.e. **Were there any problems with the written language of pupils ?**, revealed that all three agreed that pupils' expression, in simple language, was not even

achieved. SEP stated that the question paper was in English and Afrikaans but not sufficient to cater for the majority of ESL pupils. The examiner did consider the language while setting the paper, but was not sure if the right balance was achieved.

Language problems that impeded pupil progress were poor grasp of concepts; poor understanding and communication according to the examiner, sub-examiners and teachers interviewed. This seemed to mainly affect ESL pupils and although attempts were made by teachers to help such pupils, it was disappointing to learn that the pupils were not interested and the school community objected to such initiatives. This language difficulty also impeded pupils when required to answer questions in the examinations that favoured English and Afrikaans speaking pupils. The evils of apartheid once again reared its head when ESL sub-examiners also had difficulty in coping with candidates' responses. Thus, I must agree with the reporter of the Sunday Times (5 January 1997), that pupils performed poorly (earned low marks) due to their language handicap as well as that due to the language capabilities of the markers.

4.2.4. Examinations

For the analysis of examination data, response to questions 4.1; 4.1.1; 4.1.2; 4.2; 4.2.1 and 4.3 were considered. The responses appear in Table 19, page 84.

For School X, analysis of Q4.1 reveals that all pupils had seen the 1996 Specimen Examination Papers for Physical Science sent to all schools in the province of KZN. All pupils, except X2, did not see the Combined Trial Papers for Physical Science, but Pupil X2 had worked through the Combined Trial Papers through his tutor. The teacher used the Specimen Papers as an assignment. Pupil X6 did not use the Specimen Paper at all in his preparations for the final examinations. Since the teacher did not use the papers mentioned

in 4.1 for Trial examinations, no pupils could comment on the performance required in 4.1.1. However, the teacher did set her own Trial Examination Papers.

TABLE 19 : PUPILS' PERCEPTIONS - EXAMINATIONS

PUPILS	Q U E S T I O N S					
	4.1	4.1.1	4.1.2	4.2	4.2.1	4.3
X1	83; 84; 85	88; 91; 92	93	95	97; 98; 99; 104	108; 110; 116
X2	83; 85; 87	88; 91; 92	93	95	97; 98; 99	108; 115; 117
X3	83; 84; 85	88; 91; 93	92	95	97; 98; 101	108; 115
X4	83; 84; 85	88; 91; 92	93	95	97; 98; 99	108; 115; 118
X5	83; 84; 85	88; 91; 94	90	95	97; 98	108; 115
X6	83; 84; 88	88; 91; 94	90	95	97; 98	108; 115
Y1	83; 86; 89	86; 93	93	95	97; 98; 99	108; 110; 115
Y2	83; 86; 87	86; 92	93	95	97; 98	108; 116
Y3	83; 84; 86	86; 92	93	95	97; 98; 99	108; 110; 115
Y4	83; 84; 86	86; 92	93	95	98; 99	108; 110; 115
Y5	83; 84; 86	86; 92	93	95	97; 98; 99	108; 115; 117
Y6	83; 84; 86	86; 94	90; 92	95	97; 98; 99	111; 113; 115; 120
Z1	83; 85; 87	90	90	95	98; 99; 105	108; 116; 118
Z2	83; 84; 85	90	90	95	98; 105	108; 115; 119
Z3	83; 85; 87	90	90	95	98; 99	108; 116
Z4	83; 84; 85	90	90	96	96; 100	108; 110; 116
Z5	83; 84; 85	90	90	95	98; 101	108; 115; 117
Z6	83; 84; 88	90	90	96	96	108; 116

CODES : 83 = had specimen papers/given to pupils ; 84 = did not have combined trial paper ; 85 = used specimen paper as assignment ; 86 = used specimen papers as trial examinations ; 87 = combined trial paper discussed by tutor ; 88 = did not use specimen and combined trial papers ; 89 = received combined trial paper from teacher ; 90 = had no trial examinations ; 91 = set own trial examination paper ; 92 = performed poorly ; 93 = performed better ; 94 = did not write trials ; 95 = no shortage of textbooks ; 96 = shortage of textbooks ; 97 = text used to compile notes ; 98 = text used for application examples ; 99 = used Physichems extensively ; 100 = made Physichems available ; 101 = hardly used Physichem ; 104 = compared contents of different texts ; 105 = used tutor's notes ; 108 = leakage/rescheduling disrupted study plan, flow of thought and frustrated pupils ; 110 = marking was fair ; 111 = from press reports, marking was a problem ;

113 = MCQ's were tricky - spent more time on it ; 115 = paper was too long ; 116 = paper was timed correctly ; 117 = marking was too strict or unfair ; 118 = marking done by inexperienced markers ; 119 = examination stress led to depression ; 120 = rescheduling of papers gave me more time to prepare.

QUESTIONS

- 4.1. Have you written or seen the 1996 physical science specimen paper and combined trial paper ?
 - 4.1.1. How did you perform in any of the above papers ?
 - 4.1.2. How did this performance compare with symbols achieved in the november 1996 paper ?
- 4.2. Did you have access to a physical science textbook ? Elaborate.
 - 4.2.1. How did you utilise the textbook and other materials ?
- 4.3. What comments do you have about the 1996 physical science final examination papers ?

Pupils X1, X2 and X4 performed poorly as they did not study that well, but pupil X3 performed better in the Trial Examinations, since the trial paper was a copy of the 1995 ex-HOD paper, which the pupil had worked through before writing the trials. Pupils X5 and X6 did not write the trial examinations. For Q 4.1.2, no further discussion is required since response to Q4.1.1 covered this well. Pupils of School Y all had access to the Specimen Papers and also wrote portions of the paper as a trial examination. Four pupils, excluding Y1 and Y2, did not have a clue about the Combined Trial Papers for Physical Science. Pupil Y1 did in fact receive a copy of the Combined Trial Papers through his teacher whilst Y2 obtained the same through her tutor. The response to Q4.1.1 showed that pupils Y2, Y3, Y4 and Y5, performed poorly in the Trial examinations, but this did not deter them as they were now motivated towards improvement. Pupil Y1 performed very well in the Trial examinations due to his consistency. In fact the Trial mark was his highest mark in Physical Science for a long time. Pupil Y6 did not write the Trial examinations therefore no comparison could be made. The responses for Q4.1.2 complements the responses for 4.1.1 but with a slight difference for Y6. Although Y6 did not write the Trial examinations, her prediction was that she would have done better in the Trial examinations than the November 1996 examinations, as the Trial papers were merely extracts of the Specimen Papers, which she had already worked through. Pupil Y1 felt that his achievement of an A symbol for Physical Science for the November 1996 examinations, was an exceptional feat as in all his three years of Physical

Science, he never scored an A for tests, examinations, etc.

As far as the Specimen Papers and Combined Trial Papers (Q4.1) were concerned for school Z, all pupils did have copies of the Specimen Papers given by their teacher, but four pupils, except Z1 and Z3, did not have a clue about the Combined Trial Papers. Only pupils Z1 and Z3 managed to get copies of the Combined Trial Papers through their tutors. All pupils except Z6 worked the Specimen Papers as an assignment. School Z had no Trial examinations for Physical Science therefore no comparison could be made from responses to Q4.1.1 and 4.1.2. This could have had an effect on pupils while writing the final examinations without knowing how to pace themselves.

The responses to questions 4.1; 4.1.1; 4.1.2; 4.2; 4.2.1 and 4.3 were analysed to determine teacher perceptions on the examinations. The data appears in Table 20 below.

TABLE 20 : TEACHERS' PERCEPTIONS - EXAMINATIONS

TEACHER	Q U E S T I O N S					
	4.1	4.1.1	4.1.2	4.2	4.2.1	4.3
TX	83; 84; 85	88; 91; 92	93	95	98; 99	107; 108; 109; 111; 113; 115
TY	83; 84; 86	86; 92	93	96	96; 98; 101; 102	106; 108; 110; 112; 115
TZ	83; 84; 85	88; 90	90	96	96; 100; 102; 103	106; 107; 108; 109; 111; 114; 115

CODES : 102 = exposure to examination questions via worksheets ; 103 = teacher prepared notes for pupils ; 106 = poor performance due to leakage/rescheduling of examinations ; 107 = focused on rumours rather than study on own ; 109 = leaked papers too easily available ; 112 = format had no effect ; 114 = teacher had no faith in specimen paper.

(other codes as per table 19)

QUESTIONS as per table 19

The first question (4.1), was to ascertain whether pupils were issued with copies of the Specimen papers and Combined Trial Papers. All three teachers had given their pupils copies of the Specimen Examination Papers. Teachers X and Z used the specimen papers as an assignment which pupils had to work

out. The answers were discussed with pupils. Teacher Y utilised the specimen papers for the Trial examinations. Solutions were discussed with the pupils as well. According to Pupil Y1, TY never gave answers directly, but he taught around the problem, enabling pupils to work out the solution for themselves. None of the teachers gave their pupils the Combined Trial papers. TX had not seen a copy of it at all; Teachers Y and Z got these papers, through indirect means, while pupils were already on study leave, therefore they could not distribute to pupils.

Question 4.1.1 assumed that all teachers would have used the Specimen paper as a Trial examination, but only School Y did so. Teacher X set her own trial examination paper, therefore her response was related to that trial examination paper. Teacher Z had no trial examination at all. For school X, pupils generally did poorly in the Trial examinations as they were not fully prepared. Teacher Y found the same kind of results at School Y. The trial paper, set by TY, was made up with 50% taken from each of the Specimen Papers and written as one 2 hour paper. As mentioned, TZ had no trials, so no results of pupils were available. Question 4.1.2, required comparison between the trial results of pupils and the results they obtained at the end of the year (November 1996). No comparison could be made for School Z immediately. For both Schools X and Y, the pupils definitely did better in the final examinations as they were well prepared at that stage to take an examination.

Response to question 4.2, table 19, reveals that all pupils selected for this research from School X were issued with a Physical Science textbook. Pupils' response to Q4.2.1 showed that all pupils used the textbook to compile notes and solve application examples. Pupil X1 was in an advantaged position since he had two different textbooks for Physical Science, hence he referred to both in order to compare contents and clarify misconceptions. Only pupils X1, X2 and X4 made use of Physichems (booklets containing matric examination papers written in South Africa for each year). Pupil X3 made slight reference to a copy of Physichem, when doing revision. All pupils in this research

sample of School Y had a copy of a textbook, however, the other pupils were short of textbooks and therefore had to share. For this reason, the teacher avoided setting homework from the textbook, but if work was set from the textbook, it was done in class to allow all pupils to share the books. The textbook was mainly used to draw up notes and try out application examples by pupils. This is evident from their response to Q4.2.1. In addition, all pupils, except Y2 made extensive use of Physichems during their study period. Two responses of value were those of Y1 and Y6. Pupil Y1 had worked through about 14 volumes of Physichems and on the night before the final exams, skimmed through about 8 Physichems to sharpen his thinking. Pupil Y6 had this to say about the Physichems -

"I worked through Physichems to get used to level 3 and 4 questions - which is not sufficiently covered in the textbook. Further, the language in the textbook cannot be easily digested".

Four pupils besides Z4 and Z6 had a textbook for Physical Science as shown by responses to Q4.2. Those pupils that had textbooks, used them to supplement the teachers notes given, as well as practising application examples. Pupil Z4, who did not have a textbook, merely copied homework and class exercises from others, instead of borrowing a book. Pupils Z1 and Z3 had more faith in their tutor's notes than their teacher's. These were also the only two pupils who made extensive use of Physichems. Pupil Z4 did indicate that the teacher made copies of Physichems available in class for pupils to work with, but very few took advantage of it, but he did. Pupil Z5 merely browsed through one copy of a Physichem but did not actually solve any problems.

The response to Q4.2 of the teacher interview schedule referred to availability of textbooks for Physical Science. School X had 35 pupils to cater for and all pupils received a textbook. School Y only had 19 pupils yet there was a shortage of textbooks. Most pupils had copies of Physical Science 10 (Authors : Brink and Jones), whilst those that did not have this, received copies of

Senior Physical Science 10 (Authors : Pienaar and Walters). All pupils did at least have a book for Physical Science. School Z had to cater for 77 pupils, thus there were shortages and pupils were expected to share books. The follow-up question to 4.2 was 4.2.1 which planned to find out how the textbook and other materials were used by pupils. The teachers at schools X and Y used the textbook for application exercises. TY had to allow pupils to complete work during class time, especially those that had to borrow books. Teacher X used Physichems in her teaching a lot, and found it very useful to help pupils develop a problem solving strategy. Teacher Y hardly used Physichems due to its high cost, but exposed pupils to examination questions through his own worksheets that were used for different sections throughout the year. Teacher Z avoided setting homework examples from the textbook due to the shortage, but gave pupils numerous worksheets. TZ also gave pupils prepared notes. She did make Physichems available to pupils at school, but stated that only the better pupils took advantage of them.

Analysis of pupil responses to Q4.3 revealed that all pupils felt that the leakage of papers and the subsequent rescheduling of the examinations, disrupted their study plans, flow of thought, and even frustrated them. X1 was the only pupil who felt that the time allocation for the Physical Science papers was on target. The others felt that the papers were too long. Pupil X1 believed that marking of scripts was fair. Whereas X2 felt that marking was too strict or unfair. Pupil X4 felt that marking was done by inexperienced markers. This he gleaned from newspaper reports. For school Y responses of pupils were that the leakage followed by the rescheduling of the examinations, disrupted their study plans, flow of thought and may have frustrated them. The exception to this view was held by pupil Y6 who claimed that the rescheduling actually gave her more time to study. Three pupils, viz. Y1, Y3 and Y4 felt that the marking was fair, but Y6 could only say from press reports that there was a problem with marking. Y5 felt that papers were marked too strictly or in an unfair manner. As far as the timing of the examination papers were concerned, five pupils felt that the papers were a bit too long, whereas Y2 felt

that the papers were timed reasonably well. Pupil Y6 did, however, add that the multiple choice questions were very tricky and she had spent too much time on them at the sacrifice of the other questions. All pupils of school Z felt that the leakage and subsequent rescheduling of the examinations disrupted their own study plans, flow of thought and may have even frustrated them. In fact, pupil Z2, had to be treated medically and psychologically for depression as a direct result of the examinations. Four pupils except Z2 and Z5 felt that the papers were accurately timed for pupils, whereas pupils Z2 and Z5 had no time to check on questions that they had missed out or even check on their errors. Pupil Z4 felt that marking was done fairly, whilst Z5 felt the papers may have been marked too strictly or unfairly. Pupil Z1 believed that the marking was handled by inexperienced markers. His reason for this was that together with pupil Z2, they had taken the Department of Education to court over discrepancies in their results when they were re-marked by a panel of experts. Their result had improved from B to A but the magistrate had ruled against this saying that the change was not significant, i.e. it did not change from a D to an A, for example.

Question 4.3 required teachers' comments on the November 1996 examination itself. According to data in Table 20, all teachers interviewed, felt that the rescheduling of the examinations due to massive leakage of papers, disrupted pupils study plans, their flow of thought and psychologically affected them. Teacher X added that pupils seemed to focus more on rumours, rather than do their own studying. She felt that the leaked papers were too easily available. Both TY and TZ stated that pupils were already projecting their reasons for not doing well, even before writing their examinations. These pupils felt that they would do poorly due to the rescheduled examinations and not due to any other factors. Teacher Z also confirmed what TX stated about the leaked papers being too easily available and pupils concentrating more on rumours rather than study on their own. Teacher Y who was a sub-examiner for 1996, clearly felt that marking was done fairly and to the best interest of all pupils that wrote Physical Science. However, both TX and TZ could only

respond to what they read in the newspapers, i.e. that there were problems with the marking of scripts. Teacher X felt that the format of the papers, especially the multiple choice questions, was too tricky. TY found the papers to be reasonable. TZ felt that the change in format would not have influenced the way in which the pupils would have responded. All three teachers, did feel that the time allocated for each paper should have been more as there were more questions than in previous years.

An additional question in the form of Q4.8 was posed to pupils to ascertain what alternate forms of assessment they would have preferred instead of a mark obtained on a single provincial examination. The pupils' response appear in Table 21.

TABLE 21 : PUPILS' PERCEPTIONS - ALTERNATIVE ASSESSMENT

X1	X2	X3	X4	X5	X6
121	121	121	121	123	121
Y1	Y2	Y3	Y4	Y5	Y6
121	121; 123; 124	121	121	121	121; 125
Z1	Z2	Z3	Z4	Z5	Z6
121; 123; 124	121; 123	121	121; 124	121	126

CODES : 121 = have a system of continuous assessment ; 123 = test std 9 work externally at the end of std 9 year ; 124 = have other moderated examinations in std 10 ; 125 = should have a system of credits ; 126 = examinations should be easier.

The pupils of school X preferred a system of Continuous Assessment(CA) that would have given them many opportunities of arriving at a final mark. The pupil who was an exception to this was X5, who preferred an external examination at the end of the std 9 year so that there would not be such a large volume of work to study for an examination. Pupils of school Y all agreed on a system of CA as well. In addition, Y2 suggested the same as X5 together with other moderated examinations in the std 10 year, eg. moderation of practical work and a few yearmark tests. Pupil Y6 felt that there should be

a system of credits as used in the UNISA examination system. The pupils of school Z also weighed in with the idea of a system of CA, except Z6 who felt that the examinations should be made easier by including more multiple choice questions. Pupil Z1 added that there should be an external examination as well at the end of std 9 and a June and Trial examination in std 10 in order to arrive at a comprehensive assessment of pupils. Z2 agreed with Z1 on the external std 9 examinations, while Z4 supported Z1 on the external std 10 June and Trial examinations.

From a pupil perspective, the examination with its related problems was a very stressful experience, and to see twelve years of formal education hinging on a solitary examination mark, was disheartening. The doubts in the pupils minds as to whether they really got the results they wanted, opens all sorts of possibilities in terms of factors that were responsible. What the pupils did however agree on was that they should be rated on a continuous basis so that a complete picture could be obtained for all matriculants especially.

Teachers' views on an alternate form of assessment were extracted from responses made to question 4.7 (i.e. **What alternative method of assessment do you propose to replace the std 10 examinations ?**) of the teacher interview schedule. The data appears in Table 22.

TABLE 22 : TEACHERS' PERCEPTIONS - ALTERNATIVE ASSESSMENT

TEACHER	ALTERNATE ASSESSMENT
TX	121 ; 122 ; 123
TY	121
TZ	121

CODES : 122 = include a teacher component in pupil final assessment.

(other codes as per table 21)

All teachers showed a preference for a system of CA to be included into the

matric year of assessment and be used together with their final examination mark to determine the final symbols for pupils. This they felt would encourage std 10 pupils to work consistently, but more especially, pupils will not be seriously disadvantaged by leaked papers; disrupted examinations; psychological stress related to examinations; poor marking; etc. Teacher X added that there should be a teacher component included in the final mark for pupils, eg. a practical mark, that could be moderated on a regional basis. However such assessment, is only possible if the laboratory resources are normalised within regions and if the human resources are sufficient to engage in such moderation. TX also felt that an external examination at the end of the std 9 year for pupils, would help in reducing the workload for pupils in matric. The std 9 external mark would also provide the Education Administration with some mark to rely on, should there be further irregularities during examinations.

Questions 1, 8 and 10 were posed to the examiner and two sub-examiners to obtain their response on examination aspects.

For Q1, i.e. **How would you rate the 1996 HG physical science std 10 results of KZN?** All three ie. the examiner(EXM) and the sub-examiners [sub-examiner:-Physics(SEP) and sub-examiner:-Chemistry (SEC)] rated the 1996 HG Physical Science results of KZN as disastrous. The SEC mentioned that almost 50% of the pupils obtained between 0 and 20% for the entire paper. The EXM also conceded that there was a "phenomenal increase in G symbols". This, the EXM felt was reflective of the joining of the different Departments, as at 1 May 1996.

For Q8, i.e. **Did the rescheduling of papers have any effect on the pupils' results?**, rescheduling would have certainly affected pupils psychologically. According to the SEP, some pupils wrote answers that were required for leaked papers - so they could have been investigated and their results withheld. The examiner was also under stress as he had to reset a new paper

within time constraints.

For Q10, i.e. **Were there any evidence of irregularities ?**, all three definitely agreed on the irregularities - stating that there were many incidents of copying; answering for others; etc. All cases were reported to the investigating team. The following news broadcast confirms this point :-

"Shocking statistics have been released on the number of cheating incidents during the last matric examinations in the Province. There were more than 3000 matric examination irregularities in KZN last year, including 226 people who were found writing an examination on behalf of another person. 24 of them were arrested by police while the examinations were being written."

Patrick Cole (Parliamentary reporter for East Coast Radio) said that, "Education Minister, Sibusiso Bhengu, has told Parliament that of the 3326 scripts scrutinised, 578 were released for lack of evidence. Bhengu said 672 candidates were found to have been assisted by invigilators; 71 had written leaked papers; 102 cases have been reported of candidates submitting 2 papers; and just over 2000 cases of copying were identified by examiners. Bhengu said 104 candidates found guilty of serious malpractice had their results withheld and were barred from writing the KZN Senior Certificate Exams for 2 years." (East Coast Radio - News Bulletin, Thursday 21 August 1997)

Some consideration of factors that impacted positively were proper use of textbooks, Physichems (past-examination papers); and good problem-solving techniques. Negative influences were underprepared pupils due to teachers not doing sufficient revision; rescheduling of examinations due to wide scale leakage; irregularities during writing of examinations; one-off stressful examination; and poorly set papers.

Whilst an examination serves the purpose of evaluating pupils' written abilities; standardising performance; and as university entrance mechanism, it does not seem to be a plausible idea to administer an examination to every candidate as less than 25% of candidates obtain an exemption - but an even smaller percentage of these candidates actually study at universities. In fact, those that enter university, sometimes have to write an entrance examination which undermines the value of the senior certificate examinations. In addition, the examination does not assess other abilities of candidates that are crucial

to other professions and not necessarily studied at a university. Clearly, the matric examination is an inappropriate assessment tool as stated in Naidoo and Lewin (1996).

In my opinion, the various problems encountered during the 1996 matric examination process (leakages; irregularities; marking; computer glitches; etc.), have necessitated my call for the catalysed implementation of OBE. The sooner the expensive year end matric examination is scrapped, the better it will be as funds allocated for the examination can be used in other areas of need in education, such as, more resources, schools and teachers. The calls for scrapping of the examinations have also been reported in Post (13-16 November 1996) and the Sunday Times (24 November 1996). In the interim period, before OBE actually involves grade 12 (std 10) pupils, school based CA should be part of the final assessment mark for candidates. It might also be wise to consider pupils' demand in terms of Physical Science, i.e. to test grade 11 (std 9) work as soon as it has been completed and not a year later. There is sufficient content in std 10 Physical Science to set comprehensive examination papers in Physics and Chemistry for the senior certificate examinations.

4.2.5. Disruptions at School

For this analysis, responses to question 4.4 as well as the number of days absent for each pupil were considered. For the different schools the data appears in Table 23, page 96.

From Table 23, Q4.4.1 explored pupils' absenteeism, and the data revealed that pupils with a relatively low absentee rate were X1 and X4 i.e. under 20 days. The other four pupils had high rates of absenteeism, in excess of 20 days with X6 as high as 74 days. When one considers that the average number of school days to be around 185 days, pupil X6 was absent for 40% of the year. Pupils X2, X5 and X6 had no valid explanations as to their absenteeism,

although both pupils X5 and X6 stated that they worked day and night shifts at the harbour. Pupil X3 did explain that she suffered with sinusitis regularly, and even in her matric year, she missed out on work due to hospitalisation. Pupil X2 played truant a lot (a fact which he provided), thus also took school work lightly. The response to Q4.4.2 showed that all pupils agreed that their teacher was never absent or took leave therefore they did not miss out on work.

TABLE 23 : PUPILS' PERCEPTIONS - DISRUPTIONS

PUPILS	DAYS ABSENT	Q U E S T I O N S			
		4.4.1	4.4.2	4.4.3	4.4.4
X1	19	136	127	129; 130	129; 130
X2	26	137; 138; 140	127	129; 130	129; 130
X3	35	137; 139	127	131; 132	131; 132
X4	16	136	127	133; 142	133; 142
X5	54	137; 138; 141	127	132	132
X6	74	137; 138; 141	127	129; 133	129; 133
Y1	23	137; 138	127	131	131
Y2	14	136; 138	127	129; 130; 132	129; 130; 132
Y3	13	136; 138	127	129; 130	129; 130
Y4	11	136; 138	127	129; 130	129; 130
Y5	16	136; 138	127	129; 130	129; 130
Y6	30	137; 138	127	131	129; 130
Z1	15	136; 138	129; 130; 133	129; 130; 132; 133	129; 130; 132; 133
Z2	16	136; 138	129; 130; 133	129; 130	129; 130
Z3	12	136; 138	129; 130; 133	129; 130	129; 130
Z4	49	137; 138	129; 130; 133	129; 130	129; 130
Z5	28	137; 138	129; 130; 133	129; 130	129; 130
Z6	71	137; 138	129; 130; 133	133; 139	133; 139

CODES : 127 = teacher never took leave ; 129 = syllabus was rushed ; 130 = no revision done ; 131 = normal work continued ; 132 = pupil morale declined ; 133 = lost valuable time ; 136 = low absenteeism (under 20 days) ; 137 = high absenteeism (over 20 days) ; 138 = unexplained absence ; 139 = valid absence ; 140 = played truant ; 141 = worked while away ; 142 = did revision.

QUESTIONS

- 4.4. During 1996, was instruction in physical science disrupted in any way, due to :
 - 4.4.1. your own absence or illness ?
 - 4.4.2. teacher absence or illness ?
 - 4.4.3. Caretakers' strike - May 1996 ?
 - 4.4.4. Teachers' strike - August 1996 ? Elaborate on all.

Data for school Y, shows initially that besides pupils Y1 and Y6, the absentee rate was low and all six pupils had no valid explanations for their absence. The absentee rate for Y1 and Y6, although classified as high, are not as extreme as pupils X5 and X6 or even Z4 and Z6. Response to Q4.4.2 confirmed that Teacher Y hardly took leave or was absent for any length of time that could have affected pupils.

For School Z, data from table 23, very neatly showed that the high and low achieving pupils had low and high absentee rates respectively. None of the pupils provided valid reasons for absenteeism, although pupil Z6 felt that due to her late-coming on a regular basis, she may have been marked absent incorrectly. Pupil Z6 did have transport difficulties as she had to cover approximately 25 km in a single trip daily and take two taxis to get to school. As far as the teacher's absenteeism was concerned, all pupils confirmed that about a month's work was delayed when the teacher fell ill in 1995 during their std 9 year. Since no replacement teacher was appointed in her place, the teacher had to cover up work and therefore rush through the syllabus, leaving no time for revision.

The perceptions of teachers were compiled from responses to question 4.4.1; 4.4.2 and 4.4.3 of the teacher interview schedule. The data appears in Table 24 on page 98.

The response to 4.4.1 indicated that teacher X did not take leave for any long period of time, thus pupils did not miss out on instruction. Teacher Y did take

a minimal amount of study leave, but always set aside work during his absence. The work was not anything new, but merely application worksheets on work already covered. Thus any time loss due to teacher Y's absence, was not wasted. Teacher Z, fell ill in 1995 (research pupils were in std 9), and no replacement teacher was sent to the school. No work was covered during TZ's absence, for a month. When the teacher got back, she had to rush through the

TABLE 24 : TEACHERS' PERCEPTIONS - DISRUPTIONS

TEACHERS	Q U E S T I O N S		
	4.4.1	4.4.2	4.4.3
TX	127	131; 132	131; 132; 134
TY	128	131; 132	131; 132; 134
TZ	129; 130; 133	129; 130; 132; 133	129; 130; 132; 133; 135

CODES : 128 = teacher took study leave - work set aside ; 134 = teacher member of APEK ; 135 = teacher member of SADTU.
(other codes as per table 23)

QUESTIONS as per table 23, i.e. 4.4.1; 4.4.2; and 4.4.3 corresponds to 4.4.2; 4.4.3; and 4.4.4 of table 23.

Inorganic Chemistry syllabus, which was not revised during 1995 or 1996. The caretakers' strike of May 1996 and the teachers' strike of August 1996 produced some mixed responses amongst pupils as represented by data for Q4.4.3 and Q4.4.4 of table 23. Pupils X4 and X6 felt that valuable time was lost due to the strikes, whereas pupil X3 stated that normal work continued, but added that pupil morale declined during the strike period and "a holiday atmosphere prevailed". This view was also shared by X5. Pupils X1, X2 and X6 stated that due to the time lost, the syllabus was rushed and therefore no revision was done. Pupil X4 contradicts all of X1, X2 and X6 by stating that revision was done by the teacher. One is more likely to believe X4 since he was absent the least, presumably, he may have been present when revision was done and the others absent at the time. As far as the effects of the strikes, pupils Y1 and Y6 confirmed that normal work continued at school Y, but pupil morale was a problem. This meant that their teacher had to repeat work

covered and subsequently rush through the syllabus, leaving little or no time for revision. The caretakers' and teachers' strikes further added to valuable teaching time being lost at school Z. This therefore meant that the syllabus in 1996 had to be rushed as well leaving no time for trial examinations or revision. In fact pupil Z1 added that two other issues at school Z, viz. prefect problems and departmental investigations, meant that work only began at school at least three weeks after other schools in the area.

For 4.4.2 of the teacher interview schedule, i.e. time loss due to caretaker's strike, school X continued with normal work but there was a holiday atmosphere that prevailed with pupils. This resulted in a decline of pupil morale. The same occurred at school Y. For both the caretakers' and teachers' strikes, school Z lost a lot of time (about three weeks), and "pupils capitalised on the disruptions, staying away for a longer period than the strikes". At schools X and Y, normal work continued during the teachers' strike. Pupil morale did decline at these schools however, due to the neighbouring schools being on strike and the thought of another possible "holiday" was in sight. Interesting to note here was that teachers X and Y were APEK members and teacher Z was a SADTU member. The calls for a strike by teachers was heeded more by SADTU than APEK members.

Data for school Z regarding pupil absenteeism is consistent with what Mashile and Mellet (1996) found in their research, viz. high absenteeism results in low achievement and low absenteeism results in high achievement. Pupils also achieve poorly when their teacher is absent for a while (as in the case of school Z), and no replacement teacher is available. This seems to be the common practice in KZN as no funds are available for substitute teachers. The Education Department must take some of the blame for not ensuring that pupils are provided with the services of a teacher at all times. The loss in teaching time due to strike action called for by SADTU severely hampered pupils preparation for the 1996 matric examinations. Schools lost in the region of up to three weeks, even longer for pupils as they took a longer time to

readjust to "schooling". This, I must agree with the reporter (Daily News, 10 October 1996), has resulted in underprepared pupils; a poor culture of teaching and learning; and demotivated pupils. Ironically, SADTU wants to improve the culture of teaching and learning, but still calls for stayaways during school hours! Some pupils involved in this research (X5; X6; Y6) were absent from school due to the fact that they worked part-time during their matric year to supplement family income. Thus the SES of the family resulted in them missing out on work and subsequently achieving poor results. This is in agreement with Güncer and Köse (1992). The performance of pupils was hampered by their high absentee rate; time loss due to strikes, internal squabbles and investigations; and absence of teacher.

4.2.6. Parental Involvement

For this analysis, data considered were pupil responses to questions 4.6 and 4.7 of the pupil interview schedule. This data appears in Table 25 for the three schools.

TABLE 25 : PUPILS' PERCEPTIONS - PARENTAL INVOLVEMENT

	S C H O O L X					
	X1	X2	X3	X4	X5	X6
4.6	149	149	145	145	145	145
4.7	151; 152	152; 153; 154	151; 152; 155	153; 154	153	155
	S C H O O L Y					
	Y1	Y2	Y3	Y4	Y5	Y6
4.6	143; 146	145	145	145	145	145
4.7	151; 152; 153	152; 153; 154	151; 152; 153	152; 153	152; 153	151; 153
	S C H O O L Z					
	Z1	Z2	Z3	Z4	Z5	Z6
4.6	149	150	150	145	145	145
4.7	151; 152; 153	152; 153; 154	152; 154; 156	154; 156	152; 154	152; 155

CODES : 143 = had meeting before examinations ; 145 = poor turnout of parents/did not attend ; 146 = parent/s satisfied with pupil performance ; 149 = met co-incidentally ; 150 = attended meeting, but did not meet teacher ; 151 = parents had faith and trust in pupil ; 152 = supported financially ; 153 = provided emotional support ; 154 = restricted TV viewing and socialising ; 155 = hardly any parental intervention ; 156 = parent involved in examination preparations, e.g. made video recordings.

QUESTIONS

4.6. Did your parents/guardian discuss your performance with your teacher, before and after writing the examinations ?

4.7. In what other ways have your parents assisted you in the 1996 examinations ?

From Table 25, for school X, Q4.6, produced the following responses : Parents of pupils X3, X4, X5 and X6 did not attend meetings although one was held. The parents of X1 and X2 met the science teacher by co-incidence, i.e. due to X1's father being a member of the parent component of the PTSA (Parent, Teacher, Student Association). There were also opportunities where the parent enquired about X1's performance before and after the examinations. Pupil X2 got into trouble often (truancy and girlfriend problems), which meant his parents had to report to school and they also used that time to enquire about X2's performance, but only for the pre-examination period. For school Y, the parents of Y1 did have the opportunity to meet the science teacher before the examinations, but because they were more than satisfied with his results, they did not meet with teacher thereafter. None of the other pupils' parents met with the teacher. Three pupils of school Z, viz. Z4, Z5 and Z6, stated that their parents did not attend the meeting held to discuss pupils performance before the examinations. The parents of Z2 and Z3, however, attended the meeting but never met the science teacher. Z1's father met his teacher through being in the same situation as X1's father, i.e. a member of the PTSA.

Data on parental involvement came from response to question 4.6 of the teacher interview schedule. The response appears in Table 26 on page 102.

TABLE 26 : TEACHERS' PERCEPTIONS - PARENTAL INVOLVEMENT

TEACHERS	RESPONSE TO QUESTION 4.6
TX	143 ; 144 ; 145
TY	143 ; 144 ; 145 ; 146
TZ	147 ; 148 ; 149

CODES : 144 = had no meeting after examinations ; 147 = parent/s dissatisfied with pupil performance ; 148 = had no meeting before examinations.

(other codes as per table 25)

QUESTION 4.6. Have you had the opportunity to discuss each pupil's result before and after the std 10 examinations with their parents or guardian ?

Schools X and Y, had parent meetings before the examinations but no meeting thereafter. The turnout of parents at both these schools were very poor, suggesting that parents may have thought the meeting was unimportant or they couldn't find the available time. TX did however, have the opportunity to meet parents of X1 and X2, co-incidentally. This was confirmed by the responses considered for the pupil perception. TY felt that parents were generally satisfied with their children's results hence there was no need for them to meet TY after the examinations. School Z had no meeting before and after examinations, but TZ did meet the father of Z1, who indicated before examinations that pupil Z1 was confident of obtaining a distinction. However, the same parent, after the results were released, was very disappointed with the examination system and sought legal intervention. When comparing the response of TZ to those of the pupils, Z2 and Z3 stated that their parents had attended a meeting but did not meet their teacher. The teacher indicated that there was no meeting. It's quite possible that the teacher could have forgotten about the meeting, therefore did not attend, which explains why parents attended but did not meet TZ !

Q4.7 which required response on **other forms of parental intervention**, showed that, for pupils X1 and X3, their parents had faith in them and never interfered with their lives, but merely provided financial support for tuition

fees and purchasing of study aids. Pupil X6 had no intervention from parents at all. Pupils X2 and X4 had been encouraged by their parents, providing emotional as well as financial support. Their parents also had to restrict their TV time and socialisation. X5 indicated that his parents provided encouragement and a decent learning environment. Emotional support featured for all pupils of school Y, when asked how their parent contributed to their studies. The second contribution made by parents was financial support, mainly for study aids. Pupil Y6 did not benefit financially, as she was unfortunate to have a single parent that worked to barely support the family. Pupils Y1, Y3 and Y6 claimed that their parents did not really have to urge them, as their parents had faith and trust in them. For school Z, pupils indicated that their parents mainly supported them financially, viz. tuition fees and purchasing of study materials. The only pupil that did not state this was Z4. Pupil Z5 indicated that her finances was spent on travelling to school and back and not on anything else. Pupils Z2, Z3, Z4 and Z5 had to be restricted from watching too much television and socialising. Pupil Z1 did not need this as his parents had faith and confidence in his abilities and did not have to remind him of his responsibilities. He had sufficient emotional support from his parents, as did Z2. Parents of Z3 and Z4 were of assistance to their children during their study preparations. This they achieved, by recording television learning channel programmes on video cassettes and encouraged Z3 and Z4 to work through them.

School meetings held for parents were greeted with very poor turnout of parents. Parents that did have a chance to discuss their children's progress, were those of high achieving pupils, thus parents of low achieving pupils did not show much interest. This agrees with Hickman, et al (1995) even though their research was First World related. Parental involvement that occurred were mainly home-based types such as emotional support; financial aid; establishing a conducive environment; helping with video recordings; etc. This also agrees with conclusions drawn by Hickman, et al (1995) and Sui-Chu and Willms (1996), where only home-based type of parental involvement

contributed towards pupils achievement. Once again, due to the SES of parents, those that were financially well off, were able to pay for tuition for their children as well as provide financial assistance for the purchase of Physichems. This certainly contributed positively towards pupils achievement. Those parents that were not in a healthy financial position, could not provide for their children in the same way, hence impacting negatively on their achievement.

4.2.7. Pupil Performance

For this analysis, responses to Q4.5 of the pupil interview schedule were taken for each pupil interviewed. For this question pupils had to **provide reasons for their performance in Physical Science in the 1996 examinations**. The responses (coded), appears in Table 27 on page 105.

For school X, pupils gave the following reasons for their performance :

- X1: Paying more attention to Art rather than any other subject. also the Art exhibition was too close to examinations which left her with less time for other subjects. The positive contribution to her results was made by the tutor who exposed her to level 3 and 4 questions from the std 9 and 10 syllabus.
- X2: Help from the tutor definitely paid off as well as parental concern and motivation were the plus factors. On the negative side, "loafing" or generally taking schoolwork too lightly and only putting a last minute effort into studies.
- X3: Good teaching was a positive influence, however there were many drawbacks, viz. she was biased towards Physics and did not pay much attention to Chemistry; encountered problems at home -(relationship with boyfriend), thus hardly spent time at home; and illness combined with personal problems resulted in interest in schoolwork declining.

TABLE 27 : PUPIL PERFORMANCE

PUPIL	TEACHER'S PERCEPTIONS	PUPIL'S PERCEPTIONS
X1	164	172 ; 173
X2	165; 166	173 ; 174 ; 175
X3	163; 165	163 ; 165 ; 176 ; 177
X4	166; 167	160 ; 166 ; 167 ; 169
X5	165; 168	179 ; 180
X6	165; 168	168 ; 179 ; 180 ; 181
Y1	157; 158; 159	158 ; 159 ; 160 ; 182 ; 183 ; 184
Y2	160	160 ; 169 ; 173
Y3	159; 161	177 ; 180 ; 185
Y4	161	162 ; 180 ; 185
Y5	162	162 ; 180 ; 185
Y6	159; 163	172 ; 176 ; 185
Z1	157; 158; 169	169 ; 173 ; 180
Z2	157; 158; 163; 169; 170	180 ; 181
Z3	157; 161	173 ; 178 ; 180
Z4	162; 165; 171	165 ; 177
Z5	162; 165; 171	180 ; 185 ; 186
Z6	161; 168; 171	162 ; 166 ; 168

CODES : 157 = attentive ; 158 = debates, argues, questions ; 159 = provides unusual solutions ; 160 = highly organised person ; 161 = generally quiet/never responds in class ; 162 = has difficulty grasping concepts ; 163 = has personal problems ; 164 = probably over-rated pupil ; 165 = interest in schoolwork declined ; 166 = put in last minute effort ; 167 = changed from SG to HG ; 168 = frequently absent ; 169 = highly motivated person ; 170 = nervous person ; 171 = pupil not capable of HG work ; 172 = paid more attention to other subject/s ; 173 = exposure to tutor helped a lot ; 174 = parental involvement ; 175 = took school work lightly ; 176 = good teaching ; 177 = biased towards Physics ; 178 = biased towards Chemistry ; 179 = pupil and teacher did not get on ; 180 = rescheduled papers ; 181 = rushed syllabus ; 182 = pure luck ! ; 183 = developed a good problem solving strategy ; 184 = worked through plenty of examination papers ; 185 = peer learning ; 186 = poor teaching.

X4: As a result of changing from SG to HG in June 1996, pupil had to cover HG work in the remaining period leading up to the examinations. Few would have given him a chance to pass, which he did due to being highly motivated and organised. He made good use

of the textbook and past examination papers (Physichems), and also consulted with his teacher.

X5: Both factors indicated were negative influences, viz. the rescheduled examinations which disheartened pupil and the fact that teacher and pupil did not get on.

X6: All factors provided were negative influences, i.e. the same two factors as X5 in addition to being frequently absent hence missing out on a lot of work and the rushed syllabus.

The analysis of pupil performance can also be evaluated in terms of the expectancy and confidence levels. This appears in Figure 7, page 106.

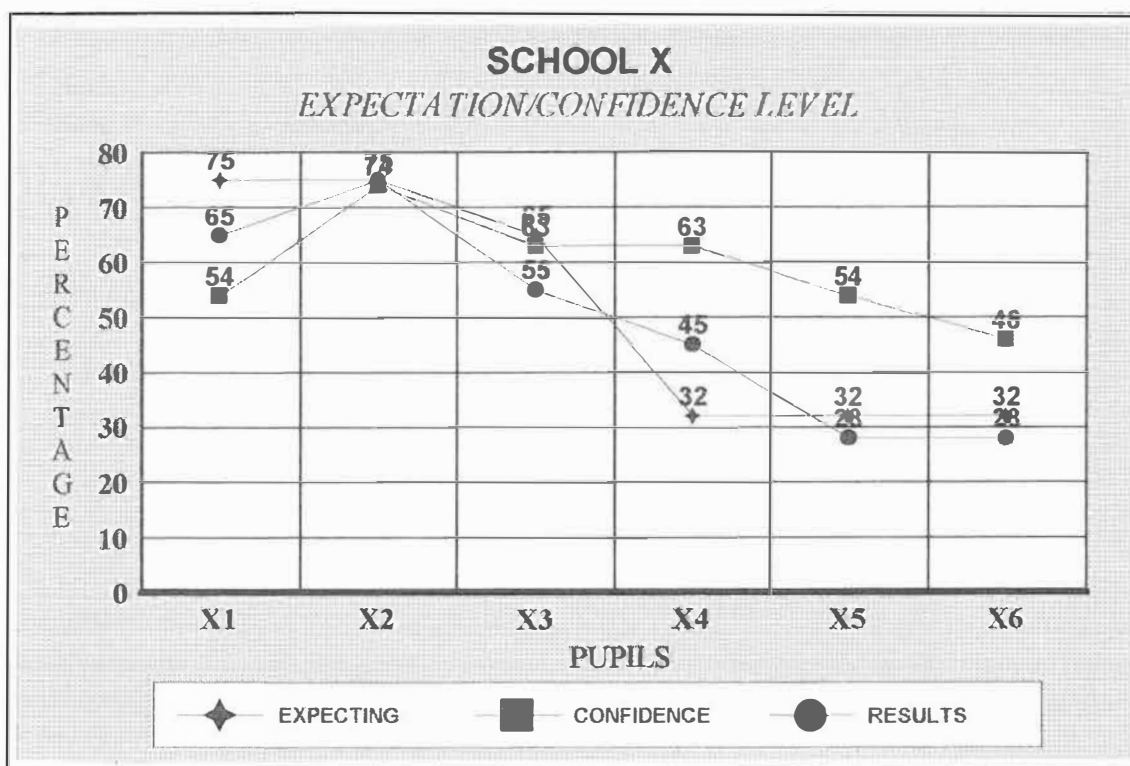


Figure 7 : SCHOOL X : EXPECTATIONS & CONFIDENCE

The self confidence test was scored as follows : for items 1 to 6, a choice of A, B, C, D and E was awarded scores of 5, 4, 3, 2 and 1 respectively. For item 7, a choice of A, B, C, D and E were awarded scores of 1, 2, 3, 4 and 5 respectively. Thus a total score of 21 or more indicated HIGH self-confidence and a total score below 21 indicated LOW self-confidence.

Pupil X1 had high expectations, but her confidence was low, so she did not get the results she wanted. X2 expected to get a B and his confidence was high due to last minute effort he put in. X3 also had her hopes high as well as her confidence was high, but her results did not match her expectations. X4 had low expectations mainly due to switching grades despite his determined effort, but his confidence got him the HG pass with an E symbol. X5 and X6 had high expectations coupled with low confidence levels, but only managed converted LG passes with an F symbol.

The teacher's perceptions, was compiled from question 4.5 of the teacher interview schedule. The teachers expected results for each pupil was also taken into consideration. First, the response to Q4.5 appears in Table 27. Teacher X felt that pupil X1 was probably overrated at school because she never performed better than a C symbol for the std 9 and 10 years. X2, due to being attracted to the opposite sex, lost interest in schoolwork, and only put in a last ditch effort. X2 received the award for best Physical Science pupil in std 8, but never realised that potential until the end of matric. Had he worked consistently, he would have obtained an A. Pupil X3 was expected to do well, but she also fell into the "love trap" and lost interest in schoolwork. She also encountered problems at home. Pupil X4 was the one that changed from SG to HG late in June 1996. TX was sympathetic towards X4 and allowed pupil to change to HG as he needed it to obtain an exemption. Although X4 passed on the HG, he did not get an exemption, as he performed poorly in Mathematics and Accounting. Pupil X5 was absent too frequently and was not interested in schoolwork. He preferred to be working to earn money, instead of being in school. Exactly the same reasons were offered for X6.

Figure 8 on page 108, shows the teachers expected results against the std 9 results and final results for each pupil.

From Figure 8, the teacher's expected results for each pupil was the same as

their final results, except for X2. This was mainly because the expected results were compiled for this research, and not sealed away in a safe before the examinations. The teacher was aware of this as it was only a guide.

According to Table 27, pupils of School Y gave the following reasons for their performance :

- Y1: He is a highly organised person, debates and argues as well as looks for unusual solutions to problems. He does not attempt a question in science without first studying the relevant theory. He has his own problem solving strategy and he worked through a large volume of application questions. All of these were considered positive influences.
- Y2: Stated that help from tutor together with her own dedication and commitment; and thorough use of the textbook were plus factors.

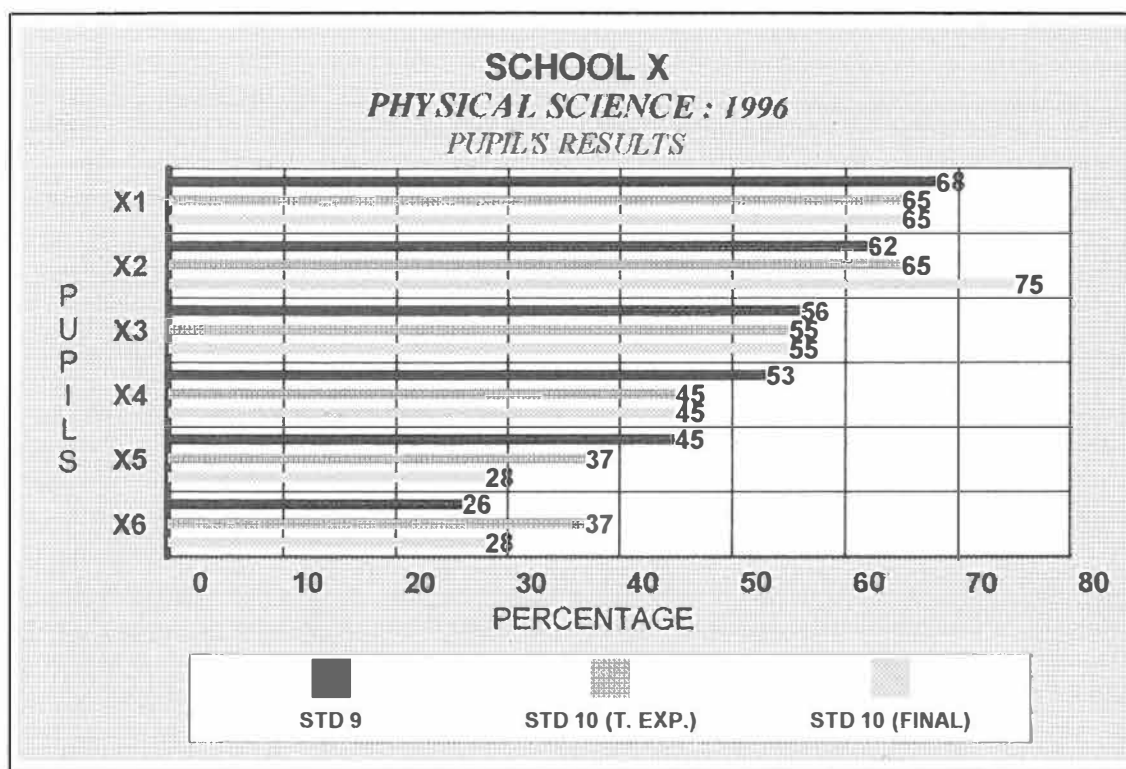


Figure 8 : SCHOOL X - TEACHER EXPECTATIONS

- Y3: Peer learning was the main force that contributed positively here. The negative influences were the rescheduled papers and pupils own bias

towards Physics which left him with less time to study Chemistry thus resorted to selecting certain sections only and studying them.

Y4: Peer learning as positive influence and negated by the rescheduled papers as well as pupil had a poor grasp of std 8 and 9 concepts.

Y5: Peer learning again quoted as the main plus factor. Pupil felt her grounding in std 8 and 9 was poor which subsequently affected anything new learnt that was related to the std 8 and 9 concepts. She also cited the rescheduling of papers as a negative factor in her performance.

Y6: Factors provided that were positive influences, viz. peer learning and good teaching. Her negative factor was that she paid more attention to other subjects, i.e. the languages, at the expense of Physical Science.

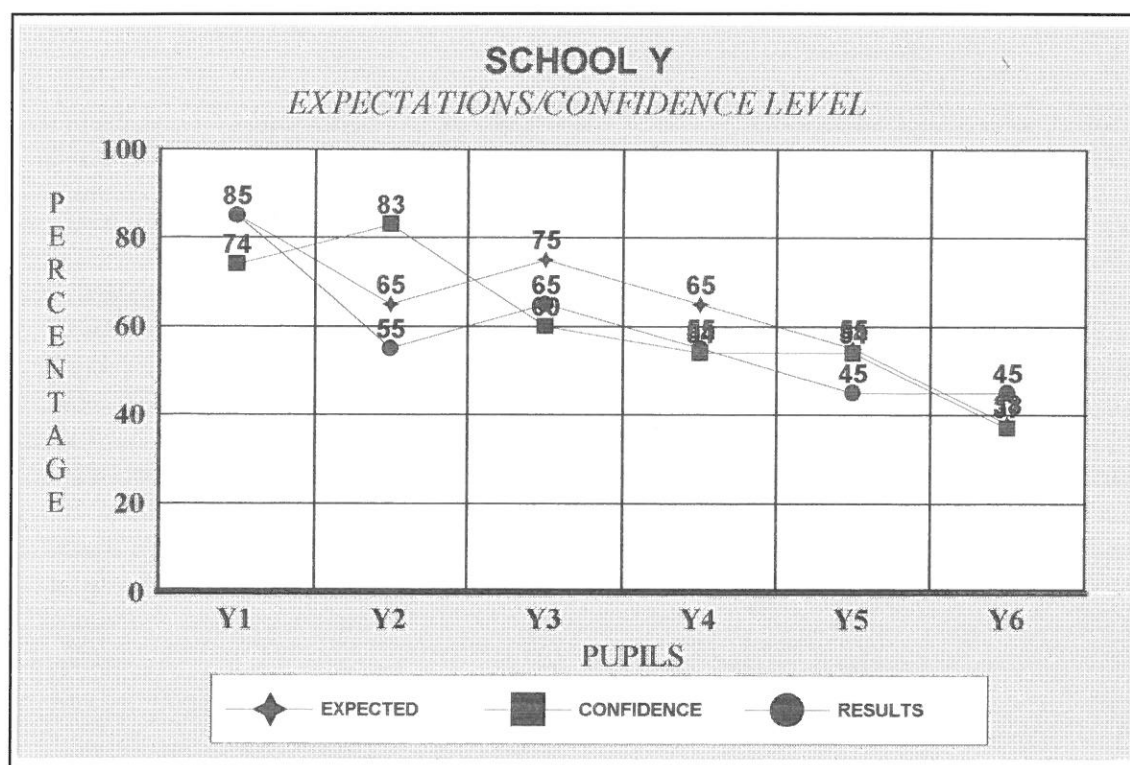


Figure 9 : SCHOOL Y - EXPECTATIONS & CONFIDENCE

The expected results and confidence of pupils of School Y appears in Figure 9 above. For Y1 both his expectations and confidence levels were high resulting in the ultimate, i.e. an A symbol. Y2 had high expectations and confidence but did not achieve accordingly. Y3 had high expectations and

somewhat highly confident, but only achieved a C. Y4 had high expectations but with low confidence achieved a D. Y5 with high expectations and low confidence, did not show much improvement on her std 9 results. Y6 had low expectations and confidence but achieved better than her own expectations.

According to table 27, TY felt that pupil Y1 was very attentive, debated and argued phenomena, and he always provided unusual solutions to problems. Y2 was well organised, having an excellent ability for record keeping. Pupil Y3 also provided unusual solutions and sometimes asked challenging questions. At times he was too quiet. Pupil Y4 was quiet, seldom responding to questions, but his work was always well maintained. Pupil Y5 had difficulty grasping concepts, solving problems and explanations. Pupil Y6 had the potential to provide unusual solutions, but something seemed to be troubling her. The teacher felt that Y6 was experiencing problems at home. The teacher's expected results for his pupils appear as Figure 10 below.

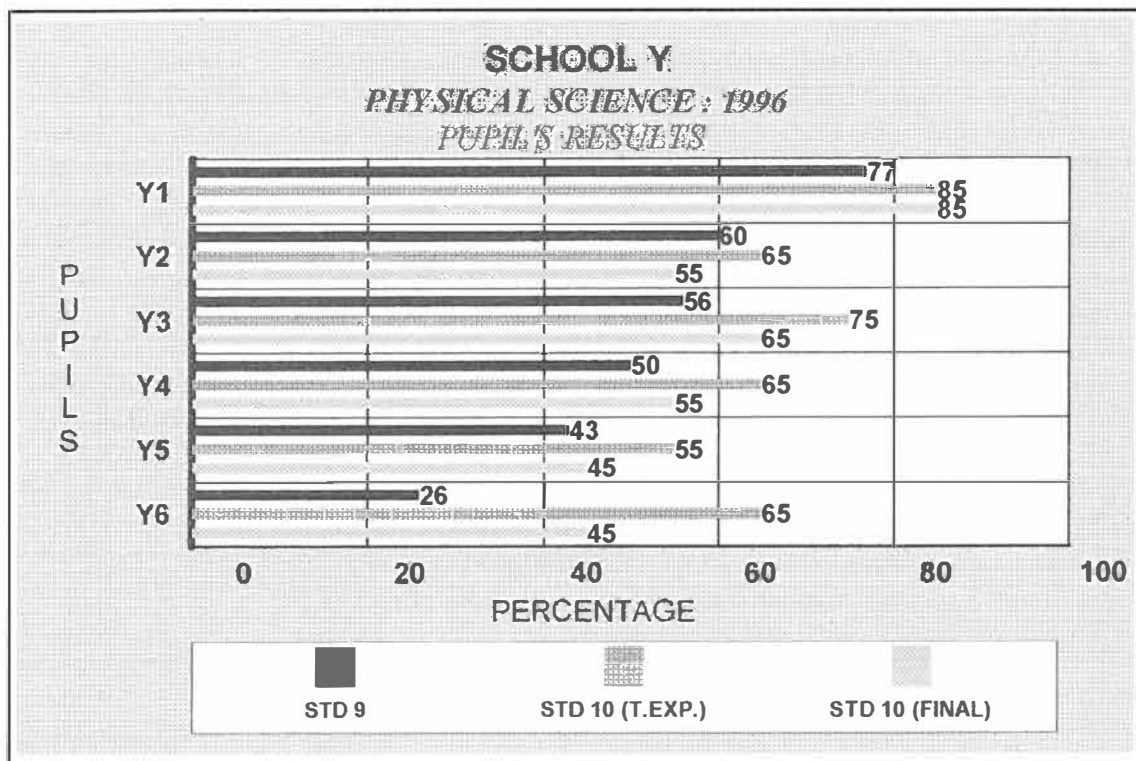


Figure 10 : SCHOOL Y - TEACHER EXPECTATIONS

Referring to Table 27, regarding School Z, pupils have given the following

views on factors related to their performance :

- Z1: The two most important positive factors were his own motivation and will to succeed as well as the expertise of his tutor. The negative factor was the postponement of the examinations which had a psychological impact.
- Z2: Felt that she was always an A student but the rushed manner in which the syllabus was completed and the rescheduling of the examinations was responsible for her decline to a B.
- Z3: Expert assistance from tutor was a definite plus factor but the negative factors were the rescheduled papers and her own personal bias towards Chemistry.
- Z4: Pupil had no choice in doing Physical Science but expected it to be practically orientated. He felt that the subject was too theoretical and thus lost interest in it.
- Z5: Peer learning was a positive influence, but this was negated by poor teaching (teacher had a negative attitude towards a class of all boys), and the rescheduled papers.
- Z6: All factors stated were negative influences, viz. frequent absence; poor grasp of concepts and last minute effort put into studies.

Combining these factors with the pupils expectations and confidence levels according to Figure 11 on page 112, the following can be stated :

Z1 was extremely confident and expected to get an A and even applied for remarking but his final result stood as a B. For legal reasons, as this matter was taken to court, pupil Z1 knew he had an A but was granted a B, which affected his admission points to tertiary institutions and therefore his career. Similarly Z2 and Z3 were equally confident and expected to get distinctions but had to be satisfied with B's. Pupils Z4, Z5 and Z6 were all highly confident and expected to do well but failed with the lowest symbols possible, i.e. H's.

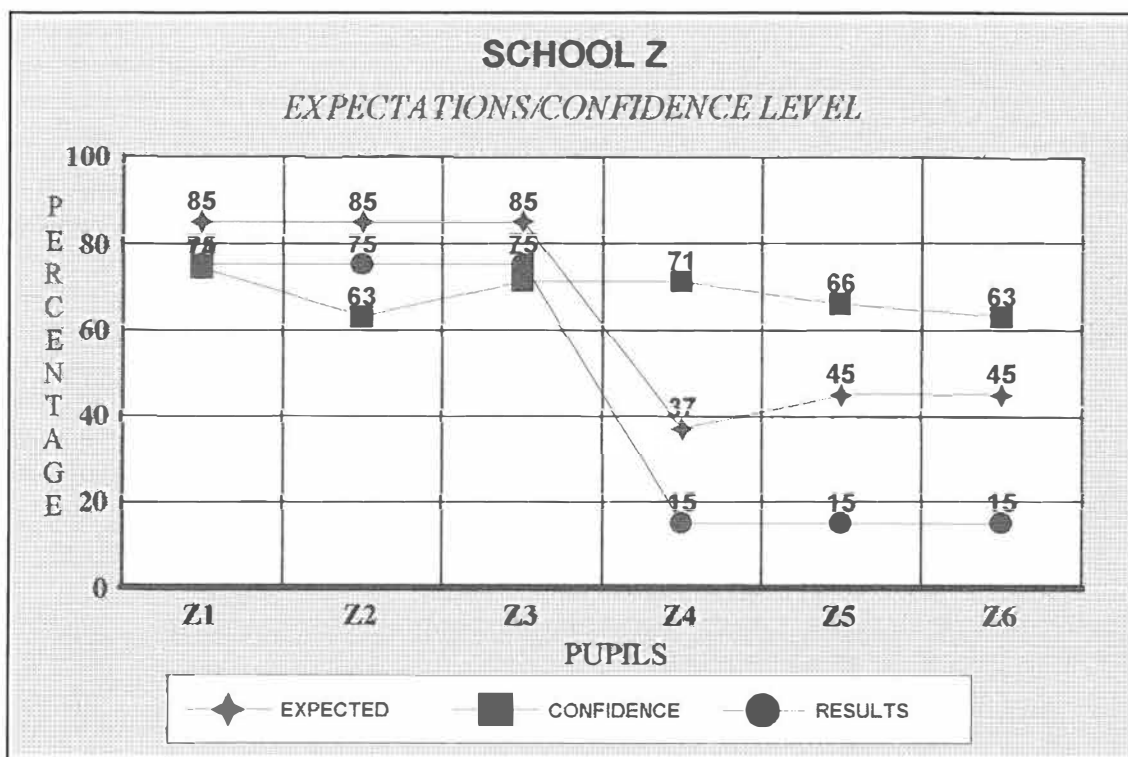


Figure 11 : SCHOOL Z : EXPECTATIONS & CONFIDENCE

From table 27, Teacher Z described pupil Z1 as attentive and one who debated and argued questions. He was also a very highly motivated person, who set high standards. He had the right attitude to get an A, but TZ was disappointed with the results. Teacher rated Z2 very highly. She worked extremely hard, and was always an A candidate. She was also highly motivated. She was a nervous pupil before any event. TZ believed that something was amiss with Z2's results. Pupil Z3 was quiet in class so it was hard to assess her, but she was attentive and conscientious. Pupils Z4 and Z5 were from a class of all boys. Their form teacher was absent most of the time, with no replacement teacher, so Z4 and Z5 were amongst the lot of pupils that were hardly in class. These pupils were not academically inclined and should not have been doing HG Physical Science. They wanted HG to write for an exemption, so TZ obliged, but pupils never took work seriously. Pupil Z6 was a very quiet pupil with a high rate of absenteeism and regular latecoming. She missed out on a lot of content as a result of this. TZ felt that Z6 should not have done Physical Science.

The teachers expected results for pupils Z1 to Z6 appears in Figure 12 below.

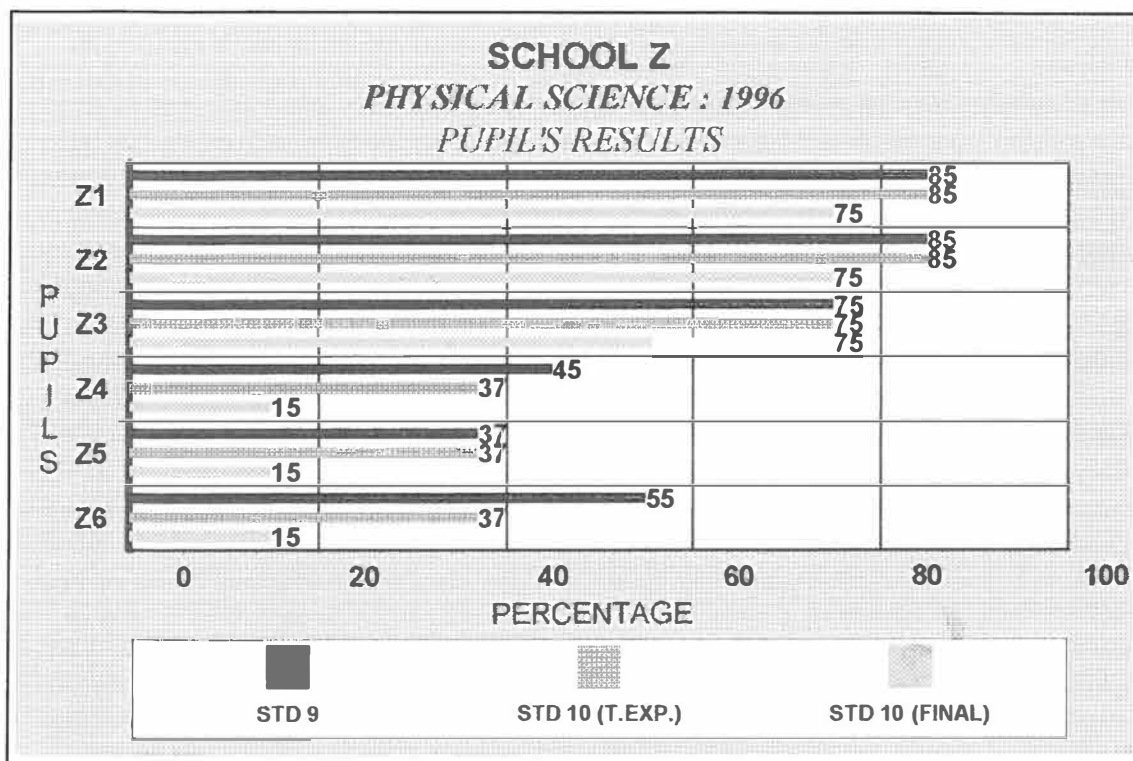


Figure 12 : SCHOOL Z - TEACHER EXPECTATIONS

From figure 12, TZ expected highly from all her pupils except Z3. Z3 seemed to have achieved the same results as predicted. The expectations of Z1 and Z2 was based on std 9 performance mainly, but this mark included a whole range of assessments as well as an examination component. Naturally, the std 9 mark was inflated due to many subjective degrees of assessment included in it, so maybe the pupils didn't achieve poor results after all. Understandably, the teacher was relatively inexperienced, so the marks obtained for the top three pupils were not far from what was predicted. The weaker pupils, Z4 to Z6, were rated generously by their teacher but obtained the lowest results possible.

From a study of the examiners report. The examiner identified general areas where pupils need to improve on, viz.

- i. show working to obtain part marks;
- ii. do not round off answers step by step, do it in the end only;

- iii. state units in the final answer;
- iv. change subject of formula before substitution.

There were certain specific areas of concern :

- i. relating velocity / time graphs to corresponding accelerations proved to be problematic;
- ii. teaching of internal resistance of cells and batteries;
- iii. application problems based on gas laws.

The two conclusions stated by the examiner, of importance, are :

1. In addition to giving pupils exercises published in textbooks, teachers should endeavour to use past year matric papers from the ex-departments. In this way, pupils will gain a wider perspective regarding the types of questions likely to be encountered in the final KZN Examination.
2. It is clear that large numbers of candidates are entered without the faintest chance of achieving a pass on the Higher Grade. The unacceptably high HG failure rate will continue in the short term unless candidates are realistically assessed during their grade 11 and 12 years and placed on the correct grade. Efforts should be made to convince pupils and their parents that there is no disgrace in writing Physical Science on the SG.

The chemistry examiner stated for question 2.1, the identification of chemical substances was poorly answered. This was a result of the absence of practical work (practicals b, c and d). Other concerns were :

1. The word role was misinterpreted to mean complete the equation.
2. Inability of candidates to differentiate between rate and yield.
3. Confusion between moles and concentration.
4. Guessing multiple choice questions.

In addition, the examiner and two sub-examiners response to questions 2; 3; 4; and 12 were as follows :

For Q2, i.e. **What may have been the possible factors responsible for the poor results in physical science ?**, the responses were :

SEP: Interpretation of questions and language expression; lack of experience and qualified teachers; lack of equipment; under-prepared pupils; concentration on leakages.

SEC: Leakage of papers; first common examination (no one knew what to expect).

EXM: Poor definitions; under-prepared pupils; lack of available past papers (rural areas); incorrect grade choice.

For Q3, i.e. **From observations while marking, where did pupils go wrong?**, the responses were :

SEP: Poor use of calculators; poor manipulative skills; poor interpretation of questions; under-preparation.

SEC: Poor explanations and application of knowledge; not responding to examination instructions (perhaps the instruction was not clear); language used in the question paper.

EXM: covered by SEP and SEC.

For Q4, i.e. **What were some of the pupils areas of strength ?**, the responses were :

SEP: Pupils did well answering questions on Millikan's experiment and Newton's Law of Gravitation.

SEC: No real strength; the good pupils did well throughout and applied their knowledge well.

EXM: Calculations at level 2 ie. merely drill type examples.

Finally for Q12, i.e. **What suggestions would you offer to physical science std 10 pupils of the future in order to perform well ?**, the responses were:

- . work through a whole lot of past papers (SEP; SEC; EXM)
- . apply knowledge (SEC; EXM)
- . read, draw and extract relevant information (SEC)

- thorough preparation (SEP; EXM)
- should have three levels of papers (SEP)

At this stage, it would be ideal to draw a comparison between two pupils, one that achieved highly and another that achieved lowly, in order to ascertain what factors have been responsible for such performances. The information appears in table 28 on page 117. Judging pupil Z6 against Y1, the following emerges as contributory factors to Z6's poor performance : high absenteeism; inexperience of TZ; language difficulties; poor examination preparation; no exposure to trial examinations; non availability of textbook; difficulty in coping with examination paper; disrupted schooling; and very little support from parents. From this, it appears that the failure of pupil Z6 can be ascribed to mainly two areas, viz. the pupil herself and the school-teacher influence. Pupil Y1 achieved a distinction in Physical Science, due to contributions made by his relatively low absentee rate; experience of TY; thorough examination preparation; exposure to trial examinations; thorough use of textbook; very little disruption of schooling; parental support (morally); and his own potential.

Positive influences on academic performance, according to pupils were : exposure to tutor; good teaching (Fuller 1987; Crossley 1977; Naidoo & Lewin 1996; and Naidoo & Khumalo 1996); good study habits (Behr 1987a; Vollmer 1986) such as pupil being highly organised, debating and arguing phenomena, providing unusual solutions, good problem solving strategy and peer learning. Negative influences on academic performance, were the pupils own bias towards other subjects or within Physical Science, i.e. preference for Physics over Chemistry and vice versa. Other influences were : absconding, absenteeism or playing truant (Mashile & Mellet 1996); last minute studying (i.e. poor studying habits according to Behr 1987a, Vollmer 1986); domestic quarrels and relationship with opposite sex; declining interest in schoolwork; rescheduled examinations and rushed syllabus (as traumatic experience for pupils, Daily News, 8 November 1996, Saturday Paper, 9 November 1996,

Sunday Tribune, 17 November 1996); poor grasp of concepts (Crossley 1977); incorrect choice of subjects due to poor ability (Jensen 1987, Teachman 1996); and teachers' attitude towards the opposite sex (Saha 1983).

TABLE 28 : COMPARISON OF LOW AND HIGH ACHIEVING PUPIL

FACTORS	LOW ACHIEVER (Z6)	HIGH ACHIEVER (Y1)
1. Std 9 Results	55%	77%
2. Expected results	E	A
3. Results obtained	H ; failed matric	A; exemption with an A aggregate
4. No. of days absent	71	23
5. Age of pupil	19	18
6. Presently studying	working as a salesperson	Information Technology
7. Intended career direction	dentistry	anything in science
8. Teachers Std 10 experience	2 years	16 years
9. Influence of teacher	positive	positive
10. Influence of others	none	revision by other teachers and while helping other pupils - positive
11. Problems with language	ESL pupil, difficulty in grasping concepts and understanding	none
12. Examination preparation	hardly any	very thorough
13. Trial examinations	none written	wrote
14. Revision	none	plenty
15. Textbook and use thereof	none	had text - thoroughly digested
16. Comment on examinations	should be easier - more MCQ's	have a CA component as well
17. Disrupted schooling	lost valuable time	hardly much time lost
18. Parental intervention	hardly much - supported financially	plenty morally- but not financially
19. Reason for good performance	none	debates; provides unusual solutions; highly organised; good problem solver; exhaustive use of past papers
20. Reason for poor performance	poor grasp of concepts; last minute effort; frequently absent	none

4.3. Analysis of School Results

Consider the data contained in Table 29. From Table 29, since 6 pupils each were interviewed, the percentage of pupils represented appearing in the table, was too small to allow any generalisation of findings for all pupils at schools X, Y or Z. This research study is therefore restricted to the subjects taken for study at each of the schools. To compare the quality of passes obtained by each of the schools, information contained in appendix XVIII was used. For school X, although the 35 Physical Science pupils made up 24% of the school matric population, according to appendix XVIIIa, the 23 Physical Science pupils that obtained exemptions represent 47% of the exemptions at school X.

TABLE 29 : RESEARCH SAMPLE

SCHOOL	PHYS. SC. PUPILS	RESEARCH SAMPLE SIZE	PERCENTAGE REPRESENTED
X	35	6	17%
Y	20	6	30%
Z	77	6	8%

The Physical Science pupils featured lowly in the senior certificate passes and failures. The 6 pupils that got senior certificate passes, represented 11% of the pupils whilst the 6 that failed represented 15% of all failures. For school Y, the 20 Physical Science pupils represent 15% of the school matric population. According to appendix XVIIIb, 12 Physical Science pupils got exemptions, representing 34% of the exemptions at the school. The 3 Physical Science pupils that obtained senior certificate passes, represented only 6% of all senior certificate passes. There were no Physical Science pupils that failed matric, but the 5 Physical Science pupils that were absent for the examinations, constituted 71% of absentees. The 77 Physical Science pupils of school Z constituted 37% of the matric population at the school. From appendix XVIIIc, 42 Physical Science pupils obtained exemptions, representing 49% of exemptions at school Z. 13 Physical Science pupils did get senior certificate passes, accounting for 35% of senior certificate passes, whilst 21 Physical Science

pupils failed matric, representing 27% of all failures. 1 out of the 6 pupils that were absent, did Physical Science, representing 17%. It is fairly clear from this that pupils at the three schools that did Physical Science as a subject obtained better quality passes (exemptions) than other pupils yet they represented a smaller proportion of pupils at these schools. This could possibly be due to the brighter pupils at the schools opting for Physical Science.

The data contained in appendix XVIII also showed the race and gender composition of pupils at each school with respect to the different types of results obtained.

Appendix XIX contains the data for each school representing the ages of pupils (separated for African and non-African pupils) that did Physical Science. For School X data was obtained from appendix XIXa, which revealed that 33 of the 35 pupils that did Physical Science fell in the 17/18 age group. Only 2 pupils were older than 18 years of age. The two pupils were both from the African group (1 male and 1 female). The male pupil failed matric for 1996 whilst the female pupil, through her perseverance, obtained an exemption. For school Y, from appendix XIXb, 17 of the 20 pupils were in the 17/18 age group and 3 (African males) were over 18 years. These three pupils, together with 2 (African males) eighteen year olds, were the five pupils that were absent for the examinations. For school Z, data from appendix XIXc, revealed that 65 of the 77 pupils were from the 17/18 age group, with 12 pupils falling in the over 18 age group. The 12 pupils over 18 years were, 3 African males; 4 African females and 5 non-African males. These 12 pupils had the following results for the 1996 matric examinations : 1 pupil was absent; 2 pupils obtained a senior certificate pass whilst the remaining 9 failed. Clearly, the pupils that were over 18 at school Z were not academically inclined and must have also failed one or two years before or were promoted conditionally. The fairly prominent appearance of African pupils in the over 18 group is evidence of the failure of the past educational systems.

Appendix XX illustrates the pupils' expected results as against their std 9 results and final std 10 results. The mean and standard deviation calculated appear in table 30, page 120.

Combining data from appendix XXa and table 30, it appeared that pupils of school X had expected results and std 9 results that were close on average to each other. Appendix XXb and table 30, jointly revealed that for school Y, pupils expected highly and did achieve better averages than their std 9 results suggested. Appendix XXc and table 30, showed that for school Z, the pupils had expectations on average to their std 9 results, but achieved worse results than both averages. Thus, in the cases for school Y and Z there were extremes, i.e teacher Y was not so generous in his assessment of pupils in std 9 as they achieved better averages at the end of std 10. Teacher Z, probably due to inexperience, was overly generous in assessing pupils in std 9. This could have also given pupils a false sense of security in expecting such high results, which eventually appeared to be at least 19% lower than either their std 9 marks or their expectations.

TABLE 30 : MEAN AND STANDARD DEVIATIONS

SCHOOL	STD 9 MARKS		PUPIL'S EXPECTED MARK		PUPIL'S FINAL MARK	
	MEAN	S.D.	MEAN	S.D.	MEAN	S.D.
X	52	13.5	52	20.1	49	17.6
Y	52	15.6	64	14.8	58	13.7
Z	64	19.0	64	21.5	45	30

A final statistical analysis that was done with results from each school was, computation (manually calculated) of the Pearson's correlation co-efficient. The formula 8.13 was used from Ferguson and Takane (1989:125), to determine the correlations between the independent variable (std 10 final results) and three separate

TABLE 31 : PEARSON'S CORRELATIONS

SCHOOL	CORRELATIONS		
	STD 9	TEACHER'S EXPECTATIONS	PUPIL'S EXPECTATIONS
X	0.86	0.98	0.92
Y	0.88	0.94	0.89
Z	0.95	0.99	0.99

dependent variables (std 9 results; teacher's expected results; and pupils' expected results). The correlations obtained, appears in Table 31 below. The correlations shown by the teachers and pupils, in terms of their expectations with the final results of pupils, were extremely high, and in three cases nearly perfect (values of 0.99; 0.99 and 0.98). This meant that the teachers' and pupils' expectations were more accurate predictors of the final results of pupils. However, I immediately discarded this interpretation, as the teachers and pupils only made their predictions for the research after knowing what results the pupils already obtained. The only reliable predictor of pupils results came from the correlations obtained when the std 9 results were correlated against their final std 10 results. The correlation was indeed very high for all three schools, producing correlations of 0.86 or more. The correlations were only restricted to the research samples, so no conclusion could be extended for all pupils pertaining to these schools. The correlations also revealed that pupils of school X were ranked fairly accurately, with slightly better rank order for school Y and an excellent, nearly perfect (0.95) rank order for school Z. Thus although TZ did not grade her pupils well at the end of std 9, she did have them ranked correctly.

4.4. Analysis of the Question Papers

There were two question papers written in Physical Science in KZN, each of 2 hours duration with a maximum 200 marks for each paper on the Higher Grade. Paper I (Physics) was written first followed by Paper II (Chemistry). Both papers contained 15 multiple choice questions. For Papers I and II, the 15 multiple choice questions, totalled 60 marks (30% of the marks set aside for the entire paper), thus should have taken pupils approximately 30% of the time, i.e. 36 minutes to complete. On average, very bright pupils, which I have tested under examination conditions, have been spending in the region of 45 minutes or more answering the multiple choice questions. If this time has to be extrapolated to obtain an estimated completion time for the entire paper, then this would translate into 150 minutes. In fact, the same pupils tested, were still answering the paper at the end of 2 hours, and only completed the paper in 135 minutes. This means that the question papers were not

weighed accurately in terms of time available to complete the paper versus marks obtained. Thus the predicted time of 150 minutes seems to be a fair reflection of the time which most pupils should finish the papers in.

For an external examination, catering for nearly 30 000 candidates most of whom were ESL speakers, there were too many questions that were longwinded and not to the point. eg. 3.1 Of paper I, on electrical circuit measurement of resistance, pupils had to focus on :

- a. the circuit diagram;
- b. the word description;
- c. data from table; and
- d. questions,

in order to answer the sub-questions, which meant going back and forth through data a to d above, in order to answer each time. The same applied to question 3.2 of Paper II based on reaction rates and chemical equilibrium. By the time pupils had got to 3.2.4, they could have easily forgotten the volume, which was not relevant for any calculations in 3.2.1; 3.2.2 or 3.2.3, but required for 3.2.4 and given 12 lines earlier. Thus the two areas of concern, in terms of what was stated about the question papers, were the time allocation for the papers and the volume of reading required to answer questions. These issues need to be looked at, especially by the panel of examiners involved in setting the papers in KZN for Physical Science.

Two questions posed to the examiner and sub-examiners were Q9 and Q10.

For Q9, i.e. **Did the majority of pupils complete the question papers ?**, the responses were :

According to SEP and SEC, the majority of pupils completed the paper. Maybe they were referring only to the questions that they marked. However, the examiner who had to moderate all questions, stated that many pupils did

not complete the paper - as there were too many blanks in the paper. The examiner felt that the paper was too long due to having 15 MCQ's rather than 10. Thus we have it right from the "horse's mouth", that the question paper was too long. Perhaps my previous suggestion of increasing the time allocation for each physical science paper to 2,5 hours does not seem far fetched after all.

For Q11, i.e. **Do you have any suggestions as to the restructuring of the question papers in physical science ?**, the response were as follows :

- . MCQ's reduced from 15 to 10 (SEP; EXM)
- . cater for ESL learners (SEP; SEC and EXM)
- . use diagrams familiar to pupils (SEC)
- . clear instructions (SEP; SEC)
- . relook at marks allocated for paper (EXM)
- . practical work to be moderated at schools (EXM)

Whilst some of these suggestions have already been made to examiners via their post marking discussion with senior markers and sub-examiners, hardly any changes were evident in the 1997 papers. Having had the opportunity myself to mark during the 1997 examinations, I have also made similar suggestions during the 1997 post-marking discussions, but was disappointed to learn that such changes might take a long time to surface, as the 1998 papers have already been set. Nevertheless, I am hopeful that someone out there is bound to take the matter further.

A whole range of factors were identified in this research, that have impacted positively as well as negatively on pupils' performance in an external examination of the magnitude as occurred in KZN for 1996. In the next chapter, I will summarise the main factors and then make certain recommendations towards improving the situation at various levels.

CHAPTER FIVE : SUMMARY, CRITIQUE, RECOMMENDATIONS AND CONCLUSION

5.1. SUMMARY OF DISCUSSION

This discussion will try to crystallise the different perceptions held amongst pupils, teachers and examiners. These perceptions were obtained through interviews of the above role players. During the interviews, respondents were not required to merely fill in a questionnaire. I was not interested in compiling a quantitative analysis of data to produce generalisations, instead I was interested in qualitative data thus the respondents were interviewed such that their personal reflections were obtained. The summary appears under different headings in the ensuing paragraphs.

TEACHER QUALIFICATIONS

From a pupil perspective - ten out of eighteen or 56% agreed that teachers' qualifications and experience influenced their performance positively. All three teachers agreed that teachers need to be qualified to teach Physical Science, but one of these as well as the matric examiner and two sub-examiners saw the actual teaching in the classroom as the most important factor on the part of the teacher. The examiner and the sub-examiners also stated that by the honesty and admission of other sub-examiners, some content was not imparted to pupils as their sub-examiner knew very little about such content (eg. friction). From these perceptions, it would seem that the following characteristics are needed to affect pupils' performance positively:-

- * a teacher who is appropriately qualified in agreement with Saha (1983) and Naidoo and Khumalo (1996).
- * the way that the teacher actually performs his/her teaching role in the classroom, not covered in this research but cited in Fuller (1987).
- * a teacher knows the relevant subject content well.
- * from the more detailed comment, the attitude and experience which a teacher has to provide, his/her interest, the use of available resources and the care for all pupils. An additional factor that seemed to have an influence was whether

the teacher was a member of SADTU or other teacher bodies. No evidence of this was found in literature.

RESOURCES

Pupils engaged in this research, felt that the lack of good working laboratory equipment at their schools did not affect their final results in Physical Science. However, due to shortage of equipment, pupils were encouraged to work in groups. This enabled them to develop group skills but not individual practical skills that are essential in further scientific studies. The poor condition of laboratory equipment was also confirmed by all three teachers. Teachers also felt that such lack of resources did not affect pupils' results in any way. One sub-examiner did mention that on a provincial level, rural schools, mainly, showed that their lack of exposure to laboratory equipment did affect the way in which pupils responded to some questions in the examinations. The examiner added that a lack of textbooks and past examination papers (a new factor not covered in literature review), significantly impacted negatively on pupils' performance. The examination papers revealed that questions of a practical nature were definitely asked by the examiner - but poorly answered due to the absence of laboratory work. Pupils had to rely heavily on textbooks or notes. Both of these were not available to all pupils. These perceptions therefore suggest that positive influence on pupil performance could be achieved by :-

- * pupils making use of textbooks in Physical Science and being exposed to questions from past examination papers (eg. Physichem).
- * reasonably equipped laboratories.
- * completion of practical work.

LANGUAGE

Pupils indicated that language did not play any role in their understanding, communicating and writing, due to a small number of ESL pupils. All teachers, however, did experience difficulties in this regard and therefore employed various strategies to cope with the problem. The examiner and two sub-examiners were able

to provide data from a much larger audience, stating that the majority of pupils experienced problems with language, both in understanding and communicating. The examiner even conceded that in the setting of the examination papers, simple language was used but he was not sure whether the right balance was achieved. My comment on this was that the question papers required tremendous ability to comprehend due to the volume of text and other data.

These perceptions suggest that positive pupil performance could be achieved by:-

- * encouraging and improving ESL pupils' written and oral communication skills in Physical Science.
- * teachers' improved ability to cope with language difficulties.
- * use of simpler language in the examinations and more structured questioning.
- * proper grading of pupils, i.e. correctly entering pupils on HG or SG based on std 9 results, or graded tests.

EXAMINATIONS

Almost all pupils (17 of 18), considered the leakage and subsequent rescheduling of the examinations as a negative influence on their performance. Pupils also felt the papers were too long. Some pupils were unhappy with the marking of scripts. Teachers also echoed the same sentiments as pupils regarding leakage, rescheduling, length of paper and marking. Both pupils and teachers had suspicions about marking through press reports, but two pupils in this research had legitimate reasons for expressing their dissatisfaction with marking. The examiner and sub-examiner added that irregularities were detected during the marking process. The examiner felt that the time allocated for the paper was too little - pupils were rushing to complete the paper, sometimes omitting easy questions. Computer errors in processing of results did not gain the confidence of pupils, parents and teachers. No one had a clear idea as to which were the genuine results as the results were changed at regular intervals. Pupils and teachers, in retrospect, were highly critical of the 1996 examination fiasco, claiming that a fairer assessment should perhaps, have also included a continuous assessment mark for the 1996 year for each candidate.

Clearly, the problems above, call the entire matric examination system into question.

- * Should millions of taxpayers money be "wasted" on an examination that is fraught with some of the above problems?
- * Should pupils be "tortured" into succumbing to the stress of a one off assessment? - or are there alternatives?
- * How reliable were the 1996 results of matriculants?
- * How accurate were the computations during the 1996 examinations?

The perceptions of the various role players suggests that to influence pupils' performance positively,

- * stricter control of examination papers need to be exercised;
- * papers need to be realistically timed allowing for all pupils to complete the paper.
- * marking of scripts to be carefully checked.
- * psychological stress to be minimised.
- * testing of practical work to be disregarded until schools are sufficiently resourced.
- * regarding the examination as just another component of a much larger continuous assessment (CA).

DISRUPTIONS

Pupils felt the time loss due to cleaners' and teachers' strikes influenced their results negatively. The syllabus was rushed and very little revision was done. Two of the teachers did do work during the strike periods, but pupil turnout was poor, and their morale was very low. Some of the pupils were absent for a large number of days which impacted negatively on their completion of syllabus and subsequent performances. Furthermore, one teacher was away for a considerable period with no replacement teacher to complete the syllabus.

Pupils' and teachers' perceptions above, suggests that in order to enable pupils to

perform positively, the following needs to be done:-

- * reduce time loss / avoid unnecessary closure of schools.
- * ensure that sufficient revision is carried out.
- * reduce pupil absenteeism.
- * reduce teacher absenteeism.

Similar suggestions were made by Makhurane (1995).

PARENTAL INVOLVEMENT

Pupils claimed that their parents hardly attended meetings held by their schools to discuss pupil performances, although meetings were held for this purpose. Parents that did have an opportunity to meet the science teachers, were generally those of high achievers. Parents did, however, provide a conducive environment at home to study, as well as providing financial and emotional support when needed. Some parents assisted by making video recordings of important science topics covered on national television. Parental pressure certainly influenced the pupils' choice of Physical Science as a subject (as for X2) but this proved to be a poor choice as the pupil involved was later persuaded to do a B.Comm degree after completing matric. Teachers also confirmed the low attendance of parents at meetings.

From these perceptions, the following parent - related factors could impact positively on pupil performance:-

- * parent SES (provision of financial support).
- * parent - teacher interactions.
- * choice of grades / subjects / careers (in agreement with Shumow et al (1996).
- * emotional (psychological) support also cited in Booth (1996).

PUPIL PERFORMANCE

The high achieving pupils gave the following reasons for good performance: help from tutor; parental pressure; good teaching; self motivation; thorough use of textbook and Physichems; highly organised person; debating and arguing

phenomenon; good problem solving strategy; peer learning. Teachers provided the following reasons for good performance:-

pupils' self - motivation; highly organised; debating and arguing phenomenon; good problem solving strategy. The examiner and sub-examiner cited good grasp of certain concepts and mastery at level 2 type calculations as areas where pupils performed well.

Pupils cited the following factors that impacted negatively on their performance, viz. poor attendance; bias towards other subjects and within physical science; poor study habits; declining interest in school work; emotional instability; rescheduled examinations; and rushed syllabus. The negative influences according to teachers were : difficulty in grasping concepts; having personal problems; over-rating pupils; declining interest in school work; frequent absenteeism; nervous pupil; and pupils not capable of HG work. The examiner and sub-examiners cited poor interpretation of questions; poor language expression; lack of resources; underprepared pupils; leakage of papers; disoriented pupils; and poor grading of pupils, as negative influences on pupil achievement.

After considering the data analysed in chapter four, the significant factors having an influence on pupil performance in Physical Science, can be narrowed down to :

1. Factors in the classroom w.r.t.
 - a) teachers' ability to teach
 - b) specific actions in doing the science
 - c) language communication.

2. The role of the examination w.r.t.
 - a) overall content
 - b) setting and marking
 - c) their part in the whole assessment.

3. School and teaching body factors related to
 - a) time loss in the school year
 - b) absenteeism
 - c) organisation of time and revision programme.

4. The role of parental support.
 - a) at school level
 - b) at home

5. The ways in which pupil operate w.r.t.
 - a) mental preparedness
 - b) attendance
 - c) sacrifices

The ability of a teacher to teach physical science successfully depends on his/her qualifications, experience and style of teaching. The teacher needs to integrate these and practically encourage pupils to want to develop scientific skills, content and knowledge. Language communication should be encouraged to its fullest where both teacher and pupils learn from each other, at the same time striving towards a written and oral command of English, until such time the language demands in examination papers are to the contrary.

An examination of the magnitude of the KZN senior certificate, needs to be thoroughly secured in terms of leakages within the Education Department. Strict control needs to be maintained at all levels of matric examinations from the entry of candidates for the examination to the allocation of marks to the correct candidate. The setting of examination papers must consider all candidates, especially ESL learners. Consideration to be given to style and layout of the question papers. The matric examination itself should not be seen as a single, terminal assessment of twelve years of schooling, but just a portion of a much larger assessment on a continuous basis.

Schools and teacher bodies need to devote much of their energies towards an uninterrupted calendar year for school pupils. As far as possible, strikes and stayaways should not be left unpunished by the employer in the first instance and by governing bodies at school level. The pupil should not be punished for something he/she did not do. Pupils' and teachers' absenteeism needs to be reduced to an absolute minimum in order for the pupil to derive maximum benefit from contact time with his/her peers and the teacher. The schools' organisation of time should enable pupils to write sufficient trial examinations before the final matric examination as well as providing sufficient revision time. Where time loss due to unforeseen circumstances occur, provision to make up lost time should also be incorporated into the schools yearplan.

Continuous feedback between teacher and parents need to be encouraged such that pupils are motivated towards performing better. This communication can take place verbally (through direct means or telephonically), or in writing. It may be necessary at times to make home visits. One cannot underscore enough the value of emotional support provided by parents/guardians during stressful times such as the matric examinations. While not all parents/guardians may be able to provide financial aid to pupils, pupils should be encouraged to obtain part-time jobs (if available), to become financially independent.

Pupils need to realise early in their matric year that a lot of sacrifice on their part needs to be made, eg. reduce socialising, TV viewing hours, extra-curricular activities, etc. Perhaps, the availability of a guidance counsellor would go a long way towards motivating pupils and assisting in career choices. Pupils need to acknowledge their limitations in terms of understanding and grasp of concepts; language ability; financial difficulties; emotional instability; etc. - and obtain help as soon as possible. Pupils must be encouraged to prepare for an examination, such as the senior certificate, in advance as there is no substitute for consistency and hard work when it comes to achieving success. Pupils also need to be at school and not elsewhere during school hours. Perhaps this is where the law could enforce punishment to any pupil of school-going age found "loitering" out of school.

5.2. CRITIQUE : LIMITATIONS AND STRENGTHS

A critique of this research would be that the findings cannot be extended to all pupils of the schools that were chosen for this research as the studies were limited to those pupils interviewed. Similarly, no generalisations can be made about all teachers and pupils that were involved in the matriculation examinations in the Province of KwaZulu-Natal.

This research was limited by lack of study leave for field work. There was, thus insufficient time to gather other research data that could have given more weight to the findings of this research. More explicitly, hardly any study leave was granted to undertake this study, as the Education Department of KZN, felt that not enough funds were available to employ a replacement teacher during my leave. Even when I did take leave (June 1997), to get some work done, the University closed, preventing any students from entering the campus.

The additional limitation in carrying out this research was the lack of any funding. To carry out the interviews; photocopying of articles; travelling to and fro during interviews; faxing; etc., was a fairly heavy burden that I had to shoulder, financially. Even though an application was made to the FRD, their reply that no funding would be available to part-time studies, was indeed very disappointing to hear as previous students in a similar position was funded by the FRD. Furthermore, application, for funding, through UDW has not received any response, even though the application went through in September 1996.

This research would have been more enriched, if the pupils' raw scores were available, together with general statistics pertaining to Physical Science in KZN and pupils' marks for the different questions of the examination scripts, were available. This data was requested through the Head of examinations in KZN, but none was received. I did not pursue the matter, and abandoned the idea. Perhaps, the missing information could be included as part of a further study on this research.

This research is also lacking in the sense that no classroom interactions were undertaken for this research in order to give more substance to what actually transpired at the classroom level. This would have given a more complete picture on the process which the teachers and pupils underwent. However, despite the limitations mentioned, the strength of this research lies in the fact that it focused on a qualitative analysis, with the hope of providing some insight into the intricate processes that occurred during the first common examinations for pupils in KZN. The research procedure adopted, ensured that there was no mere completion of a questionnaire to obtain a cause-effect relationship, that some research tends to produce. There were lots of in-depth investigation during the interviews which enabled me to grow as an interviewer in the first instance, and secondly, the interview process helped in developing a global picture of the interviewees by conducting the interviews at their homes.

5.3. RECOMMENDATIONS

As outlined in 5.2, one recommendation would be that the pupils' raw scores and marks per question could be obtained. A diagnostic analysis could be made to ascertain pupils' areas of strengths and weaknesses as well as the teachers' area of strengths and weaknesses. Workshops could then be held on a regional basis, especially in the rural areas, to highlight these strengths and weaknesses of pupils and teachers. The idea being, not to expose any individuals concerned, but to use the expertise of other teachers and encourage building the capacity of teachers that need assistance, towards improving their practice. I would like to suggest that sufficient copies of one bright pupil's and one weak pupil's answer scripts be made, without previous evidence of marking on it, and utilised at the capacity building workshops suggested above, in the following manner

- * give each teacher a copy of the pupil script
- * give each teacher a copy of the expected answers
- * ask each teacher to mark the entire script with the aid of the memo
- * get teachers to discuss variations (if any) in marks allocated to the script.

This exercise would serve at least three main purposes :

- a) to develop concepts and content
- b) to allocate marks fairly to a candidate
- c) appreciate alternative answers and conceptions.

A second recommendation, would be to carry out sufficient classroom observations in order to ascertain the processes used by pupils and teachers towards preparing for an external examination. These findings could then be made available to other pupils and teachers who are involved in the preparation for examinations.

Thirdly, I would like to recommend that the relevant officials responsible for the funding of schools, whether it is the governing bodies of a school or the education department itself, should make an all out assault in obtaining laboratory equipment in sufficient quantity; past examination booklets such as Physichem for library control and pupil use; and textbooks for all pupils (matric pupils given priority). As far as laboratory equipment is concerned, industries could be approached in the area, to sponsor or donate their unwanted apparatus to schools. This would enable pupils to carry out practical work and therefore appreciate Physical Science. The pupils would also develop skills related to manipulation of apparatus and measuring techniques. The availability of past exam papers at all schools would enable pupils to expose themselves to different levels of questions that are normally tested in examinations. Pupils having their own textbooks would encourage them to work through independently before class work so that they could question or challenge the content when the teacher teaches them.

Fourthly, from a planning and policy-making perspective, subject advisors should encourage physical science teachers to meet regularly, say once a month, so that sharing of resources in the form of apparatus, worksheets, testing material, notes, etc, could take place. This would be of use to all needy teachers. Official time needs to be set aside for this and the necessary arrangements communicated to teachers via the principal, through the subject advisors. In addition, during each gathering of teachers,

one member of the panel of examiners could discuss problem areas experienced in past examinations.

A fifth recommendation, as indicated in chapter four of this research, would be to examine std 9 Physical Science content of the syllabus at the end of std 9, as an external examination. If this is not possible for the Education Department to handle, then at least on a regional basis, a group of teachers should make the effort to set their own regional examinations on a common date. This mark obtained, in a controlled manner, could be a useful guide in assessing the pupils' worth by the end of their matric year and also aid in the correct grading of pupils. Furthermore, it would give pupils some experience into writing an "external" examination. This, as suggested by the subjects interviewed for this research, could be combined together with a trial examination in matric and a CA mark to arrive at a fairly comprehensive indication of a pupil's worth. This could also be used as the pupil's examination mark should any problems be encountered in a massive Provincial examination.

The sixth recommendation concerns the physical science syllabus, which at present has very little relevance to most South Africans, needs to be restructured so that it is suitable to the African continent and especially to local circumstances. This is what planners at national and provincial level are presently working on so that simultaneously OBE (outcomes based education) would be implemented.

A seventh recommendation, would be towards refining the examination papers. At present the examination papers in Physical Science are heavily loaded with too many marks for the time allocated for completing the papers. As suggested in this research, an ideal would be to increase the pupil response time to a total of 2,5 hours per paper. Further, the wording and general structure of the papers can be revised to produce ones that are user friendly, i.e. easy to read and to the point when requiring an answer. Leave the high level of Physics and Chemistry understanding for separate University entrance examinations where academics need to be selected, as not all pupils doing Physical Science at school end up doing Physics or Chemistry beyond std 10. An additional area that could be explored, comes from the suggestion made

by the SEP interviewed, and that is that the question paper in physical science, should also have been printed in Zulu to give ESL pupils a better chance at comprehending. After all Afrikaans speaking pupils have been advantaged by the fact that question papers are printed in Afrikaans, yet they form a minority group. This would go a long way towards levelling the playing fields as such.

In addition to a whole series of capacity building workshops suggested previously, an eighth recommendation concerns teacher upliftment in terms of improvement of qualifications and content knowledge. This could take the form of in-service (INSET) and pre-service (PRESET) programmes conducted by the education department. This would enable the teacher to teach physical science more confidently and therefore encourage pupils to perform better.

The ninth recommendation involves the active participation by parents in two areas that would be of importance towards improving pupils' performance. These are: regular meeting with teachers of physical science to discuss pupil progress; and monitoring of irregular attendance and truancy of pupils, with the assistance of the schools' governing bodies. Where SES of family warrants such absenteeism due to pupil assisting parent(s) in meeting financial burden, then some form of support service needs to be provided so that the pupil does not become a victim of circumstance.

A final recommendation aimed at the directorate of examinations in the province of KZN, would be to get their act in order, in terms of the security of examination papers; control of appointments of sub-examiners; processing of results; etc, so that the examination does not become an exercise in futility, as well as not disorienting pupils. In fact, at the present moment (December 1997), the entire examination process has gone through without a single hitch. Lets hope it continues this way into the new year when results are due to be released, then we can all raise our thumbs up to the department for having learnt so much and rectifying major blunders in such a short space of time!

5.4. CONCLUSION

The conclusions drawn from this research are merely what was summarised in 5.1. However, I would like to add that the intention of this research was not to arrive at definite conclusions in terms of factors that affected pupils' performance, as the factors varied from one case study to another. This is mainly due to the fact that the teacher and pupil are part of a very intricate web of powerful and not so powerful human and social interrelationships, which cannot be isolated and studied in a vacuum.

What was clear though, was that pupils perceived the situation from their own problems, experiences, etc. and therefore were even optimistic when it came to their expected results. They did not base their expectations on past results, but on what they thought they would have got, because only they would have known how really prepared they were before the examinations. The teachers on the other hand, based their perceptions on evidence in front of them, eg. std 9 results or test performance during the year. The examiners and sub-examiners based their perceptions from real evidence, i.e. what they saw from what pupils gave as answers. Thus all three would have provided valuable insight from their own perspectives, and this is how we should really see things.

TABLE 32 : COMPARISON OF PASS RATES - KZN (1996/1997)

	1996	1997
Number who wrote	86 574	102 381
Passed	53 422	55 254
Obtained Senior Certificate	33 425	36 432
Obtained Matric Exemption	19 997	18 822
Percentage Pass	61,7%	54,0%
Percentage Senior Certificate	38,6%	35,6%
Percentage Matric Endorsement	23,1%	18,4%

If one compares the 1996 matric results in KZN with 1997 (see table 32, page 137), one would immediately see that despite disruptions and leakages which were unique to 1996, candidates still performed better than in 1997. If there were no disruptions and leakages for 1996, would the pass rates for 1996 been higher than shown above? I would think not, for in the state of pandemonium, not all irregularities were punished as evidence available proved to be inconclusive. Thus, I have my doubts on the higher pass rates for 1996, as many dishonest pupils got away. Logically, the 1997 results ought to have been better than 1996, but the additional 16 000 odd candidates could account for the "poorer" results as some of these candidates could have been promoted at the end of 1996, due to continuous assessment and conditional transfer requirements (maybe due to age or to create space in grades below). Another possible explanation for poorer performance in 1997 could be due to the chaotic state in which schools were plunged since May 1997 when about 3 000 teachers opted for VSP's. I would therefore not discard the effect that the disruptions and leaked papers had on matric pupils' performance for 1996.

School Z, in this research, appeared as the underachieving school in terms of the provincial pass rates for 1996. The following two newspaper reports should give a clearer picture of what school Z encountered for 1996.

There is a breakdown of discipline at **school Z**, where the school's administration office entrances are barricaded with steel gates for fear of violent attacks. The school has an integrated population of Indian and African children, totalling 1125, and horror tales of racial prejudice contribute to widespread behavioural problems. The teacher-pupil ratio is 35:1, with small classrooms and a staff complement of 51. With some African children experiencing language difficulties, Mr. PZ (the acting principal), said other pupils became bored as it slowed down their academic progress. "As a result, children were leaving their classes and indulging in other activities outside school". Commitment to learning is slowly disintegrating in the school, and the shift towards a culture of learning is stagnant.

There is no place for the three R's in education '96. (Sunday Tribune : 15 September 1996)

... The departmental investigation, conducted by three superintendents of education, was instituted late in 1996, after concern by parents over the lack of discipline at **school Z**. It was alleged that some pupils as young as 13 were playing truant, gambling at a nearby casino, smoking cigarettes and dagga, and indulging in liquor and gang warfare on the doorsteps of the school. Teachers claimed

there was a lack of discipline at the school, a high rate of absenteeism and that they were over-stressed. Parents, however, alleged that the teachers themselves lacked discipline. It was claimed that teachers had drunk alcohol on the school premises during working hours. **Drink and drugs school - teachers rapped** (Post : 5 February 1997).

What is very clear to me as far as the situation at school Z (and possibly at schools X and Y) is concerned, the pupils and staff at predominantly ex-HOD schools are not ready to handle racial integration. Clearly such schools' cry for help should not go unnoticed. This is where experts in the field of racial integration and race relations (if there are any), should come to the fore and rescue education before it is too late.

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APPENDIX I

EX - NED SCHOOL

4 February 1997

Mr H Sookraj
Centenary Secondary
Dunnottar Avenue
ASHERVILLE
4091

Dear Mr Sookraj,

With reference to your letter delivered to the school today, I regret to inform you that I am not in a position to provide access to the three requirements for your dissertation viz:

1. 1996 matric exam results;
2. a copy of the matriculants' contact addresses and telephone numbers;
3. an interview with the teacher.

I also do not appreciate the high-handed tone of your letter where you have accepted that the permission will be a "fait accompli" and that, in fact, a request has not actually been made.

Yours faithfully,

--- signed---

SENIOR DEPUTY PRINCIPAL

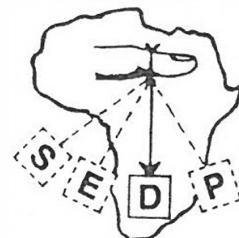


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3 February 1997.

PERMISSION TO ENGAGE IN RESEARCH.

I, Mr. Heeraman Sookraj, Reg. No. 8014451, am a registered student at the above mentioned university, for an M.Ed. degree in Science Education. As part of the requirements for the degree, I need to do a mini-dissertation.

The title of my dissertation is :-

A qualitative analysis of factors that have a bearing on Std 10 Physical Science results (exam marks) of selected schools in the greater Durban area.

I have thus chosen your school at random for the purpose of this research. It would be appreciated if you would allow me access to the following :-

1. a copy of the 1996 matric exam results for your school;
2. a copy of the 1996 matriculants' contact addresses and telephone numbers; and
3. an interview with the 1996 Std 10 Physical Science teacher.

The school, pupils and teacher will not be identified in any way, thus all information will be treated as strictly confidential.

A draft copy of the completed research will be made available to your school.

Thank you.

Yours faithfully.


H. SOOKRAJ

PS. I can be contacted at :-

WORK
TEL: 280895
ADD: CENTENARY SECONDARY
DUNNOTTAR AVENUE
ASHERVILLE
4091

HOME
TEL: 822043
ADD: 17 HALPIN AVENUE
RESERVOIR HILLS
4091

APPENDIX III

PUPIL DATA

[illegible]

APPENDIX IVa

NAME OF SCHOOL : SCHOOL - X TEACHER : TX

Dear Colleague

Please complete the following schedule below w.r.t. pupils at your school who have written the 1996 November examinations in Physical Science.

PUPIL	GRADE HG / SG	NO. OF DAYS ABSENT	STD 9 RESULTS	EXPECTED STD 10 RESULTS	YRS. TEACHER KNOWS PUPIL	REPEATING STD 10 YES / NO
X1	HG	19	68%	C	3	No
X2	HG	26	62%	C	2	No
X3	HG	35	56%	D	2	No
X4	HG	16	53%	E	2	No
X5	SG	54	45%	F	2	No
X6	SG	74	26%	F	2	No

NB. Also complete a general report / profile of each pupil listed above as it will be useful during your interview.

KEY : HG - Higher Grade ; SG - Standard Grade

APPENDIX IVb

NAME OF SCHOOL : SCHOOL - Y TEACHER : TY

Dear Colleague

Please complete the following schedule below w.r.t. pupils at your school who have written the 1996 November examinations in Physical Science.

PUPIL	GRADE HG / SG	NO. OF DAYS ABSENT	STD 9 RESULTS	EXPECTED STD 10 RESULTS	YRS. TEACHER KNOWS PUPIL	REPEATING STD 10 YES / NO
Y1	HG	23	77%	A	3	No
Y2	HG	14	60%	C	3	No
Y3	HG	13	56%	B	3	No
Y4	HG	11	50%	C	3	No
Y5	HG	16	43%	D	3	No
Y6	HG	30	26%	C	3	No

NB. Also complete a general report / profile of each pupil listed above as it will be useful during your interview.

KEY : HG - Higher Grade ; SG - Standard Grade

APPENDIX IVc

NAME OF SCHOOL : SCHOOL - Z TEACHER : TZ

Dear Colleague

Please complete the following schedule below w.r.t. pupils at your school who have written the 1996 November examinations in Physical Science.

PUPIL	GRADE HG / SG	NO. OF DAYS ABSENT	STD 9 RESULTS	EXPECTED STD 10 RESULTS	YRS. TEACHER KNOWS PUPIL	REPEATING STD 10 YES / NO
Z1	HG	15	A	A	3	No
Z2	HG	16	A	A	3	No
Z3	HG	12	B	B	3	No
Z4	HG	49	E	F	2	No
Z5	HG	28	F	F	2	No
Z6	SG	71	D	F	1	No

NB. Also complete a general report / profile of each pupil listed above as it will be useful during your interview.

KEY : HG - Higher Grade ; SG - Standard Grade

APPENDIX V

CRITICAL QUESTION 1 : PUPIL INTERVIEWS

1. TEACHER QUALIFICATIONS

Give pupils a brief resume on their teacher's qualifications and experience.

1.1. Do you think that it is important to have qualified teachers to teach Std 10 Physical Science? YES/NO

1.1.1. What minimum qualifications should be attained?

1.1.2. Academic? Professional?

1.1.3. For improved academic performance?

1.2. Has your teacher's qualifications and experience had any impact on your performance in Physical Science? Elaborate.

2. RESOURCES

2.1. What resources were used to enhance your Physical Science lessons?

2.1.1. How did use of these resources influence your performance?

2.2. What resources were lacking?

2.2.1. Did the lack of these resources influence your performance?

2.3. Have you made use of other teachers or tutors in Physical Science? Did it help?

3. LANGUAGE

3.1. Was the teacher's use of language and that of other pupils in the science class easily understood by you? Were you able to cope? Were there any difficulties?

3.1.1. Did the language difficulties of others impede your progress? Elaborate.

4. MISCELLANEOUS

- 4.1. Have you written or seen the 1996 Physical Science specimen paper? Combined Trial Paper?
 - 4.1.1. How did you perform in any of the above papers?
 - 4.1.2. How did this performance compare with symbols achieved in the November 1996 paper?
- 4.2. Did you have access to a Physical Science textbook? Elaborate.
 - 4.2.1. How did you utilise the textbook and other materials (Physichem; Past exam papers; etc)?
- 4.3. What comments have you about the 1996 Physical Science Final Examination papers? (leakages; rescheduled papers; marking; etc)
(change in format; time allocation; etc)
- 4.4. During 1996, was instruction in Physical Science disrupted in any way? Due to:
 - 4.4.1. your own absence or illness,
 - 4.4.2. teacher absence, illness or exams,
 - 4.4.3. Caretakers strike -- May 1996,
 - 4.4.4. Teachers strike -- August 1996?Elaborate.
- 4.5. What do you attribute as the main reason/s for your performance in Physical Science in the 1996 exams?
- 4.6. Did your parents/guardian discuss your performance with your teacher, before and after writing the exams?
- 4.7. What other ways have your parents assisted you in the 1996 exams? (restriction of TV times; socialising; etc.)
- 4.8. What alternate assessment would you have preferred instead of the exams?

4.9. How did you complete the following experiments ?

- a. test for chloride, sulphate and carbonate ions
- b. reducing action of H_2S
- c. precipitation reactions of H_2S
- d. test for H_2S
- e. phase equilibrium of water
- f. Ohm's law

APPENDIX VI
SELF CONFIDENCE SCALE

USUALLY	RATING	SELDOM
1. If I worked hard in preparation, I am usually optimistic and expect to do well.	A B C D E	1. If I worked hard in preparation, I am seldom optimistic and expect to do well.
2. Before an exam, I am usually well concentrated and ready to do my best.	A B C D E	2. Before an exam, I am seldom well concentrated and ready to do my best.
3. I am usually satisfied with my preparation for an examination.	A B C D E	3. I am seldom satisfied with my preparation for an examination.
4. In connection with exams, I usually have high self-confidence and trust that my intellectual abilities are good.	A B C D E	4. In connection with exams, I seldom have high self-confidence and trust that my intellectual abilities are good.
5. The last few days before an exam, I usually try to relax and take it easy.	A B C D E	5. The last few days before an exam, I seldom try to relax and take it easy.
6. I usually find exams exciting and stimulating.	A B C D E	6. I seldom find exams exciting and stimulating.
7. Before an exam, I usually wonder whether there are topics I don't know enough about.	A B C D E	7. Before an exam, I seldom wonder whether there are topics I don't know enough about.

KEY : A - usually (all the time) ; B - usually (sometimes) ; C - neutral ; D - seldom (sometimes) ; E - seldom (all the time)

APPENDIX VII

CRITICAL QUESTION 2 : TEACHER INTERVIEWS

1. TEACHER QUALIFICATIONS

1.1. Do you think that it is important to have qualified teachers to teach Std 10 Physical Science? YES/NO

1.1.1. What minimum qualification should be attained?

1.1.2. Academic? Professional?

1.1.3. For improved academic performance?

1.2.

1.2.1. Do you think that your qualifications or experience or both, has had an effect on pupils performance? Elaborate. Did it impact positively or negatively?

2. RESOURCES

2.1. What available resources (human and physical) have you used to enhance the teaching of Physical Science? (Prompts; staff; textbooks; equipment; curriculum packages; etc.)

2.1.1. What resources have you not used? Elaborate.

2.1.2. Which resources have you used for better pupil performance and why?

2.2. Which resources do you think a Physical Science teacher should utilise to achieve better academic performance of pupils? Why?

3. LANGUAGE

3.1. Did you experience any difficulty in communicating with second language English speakers during your Physical Science lessons? Elaborate.

3.1.1. How did you cope? Did you adopt any special programme for these pupils?

3.1.2. Did pupil language difficulties impede other pupils progress? Elaborate.

4. MISCELLANEOUS

4.1. Have your pupils written or seen the 1996 Physical Science specimen paper?

Combined trial paper?

4.1.1. How did they perform in any one?

4.1.2. How did their performance compare with symbols achieved in November 1996 papers?

4.2. Were there any shortage of textbooks?

4.2.1. How did pupils utilise textbooks and other materials (Physichem; past exam papers; etc)?

4.3. What comments do you have about the 1996 Physical Science final exam papers?

(leakages; rescheduled papers; marking; etc)

(change in format; time allocation; etc)

4.4. During 1996, was instruction to pupils in Physical Science, disrupted in any way?

Elaborate.

4.4.1. teacher leave (absence; illness; exams; etc)

4.4.2. caretakers strike -- May 1996

4.4.3. teachers strike -- August 1996?

4.5. What do you attribute individual pupils performance to? (Pupils selected for research)

4.6. Have you had the opportunity to discuss each pupils results before and after the Std 10 examinations with their parents or guardian?

4.7. What alternative do you propose to replace the Std 10 exams?

APPENDIX VIII

NAME OF TEACHER : _____

QUALIFICATIONS : (ACADEMIC) _____ (WHERE) _____

(PROF) _____ (WHERE) _____

TEACHING SUBJECTS : _____

NO. OF YEARS OF TEACHING EXPERIENCE : _____

NO. OF YEARS TEACHING PHYSICAL SCIENCE : _____

NO. OF YEARS TEACHING STD 10 PHY.SC : _____

NO. OF YEARS OF EXPERIENCE AS SUB-EXAMINER : _____

MEMBERSHIP TO PROFESSIONAL BODIES : _____

INVOLVEMENT IN SUBJECT AREA : _____

INVOLVEMENT IN COMMUNITY : _____

WERE THE FOLLOWING PRACTICALS DONE DURING THE STD 9 & 10 YEAR ?

PRACTICAL	YES/NO
i. test for chloride ions	_____
ii. test for sulphate ions	_____
iii. precipitation reactions of H_2S	_____
iv. test for H_2S	_____
v. reducing action of H_2S	_____
vi. phase equilibrium of water	_____
vii. ohm's law	_____

REASON (IF NO)	HOW (TH.) (PR. T/D) (PR. P/P)
i. _____	_____
ii. _____	_____
iii. _____	_____
iv. _____	_____
v. _____	_____
vi. _____	_____
vii. _____	_____

KEY : TH. - practical work done only theoretically.
PR. T/D - done as a practical demonstration by teacher.
PR. P/P - done as a pupil practical.

APPENDIX IX

CRITICAL QUESTION 1 : EXAMINER/SUB-EXAMINER PERCEPTIONS

1. How would you rate the 1996 HG Physical Science Std 10 results of KwaZulu Natal?
2. What do you think may have been the possible influences?
3. From your observation, while marking, where did pupils go wrong?
4. What were some of the pupils area of strength?
5. Do you think that results were poor due to :
 - 5.1. underqualified teachers?
 - 5.2. inexperienced teachers?
 - 5.3. both 5.1. and 5.2.?
6. Did the performance of pupils in any way reflect lack of resources at schools?
7. Were there any problems with the written language of pupils?
8. Did the rescheduling of the papers have any effect on the pupils results?
9. Did the majority of pupils complete the question paper?
10. Was there any evidence of irregularities?
11. Do you have any suggestions as to the restructuring of the question papers in Physical Science?
12. What suggestions would you offer to Physical Science Std 10 pupils of the future in order to perform well?

APPENDIX X

SYSTEM OF CODES USED FOR THE ANALYSIS OF INTERVIEWS

A. TEACHER QUALIFICATIONS

1. Yes
2. Diploma/Degree at teaching institution (with 1st year university courses)
3. B.Paed (Bachelor of Paedagogics degree) (with 2nd and 3rd year university courses)
4. Degree with internship (1 year minimum)
5. Degree with coverage of school syllabus
6. Matric only
7. Beyond matric (1 or 2 year courses)
8. Full degree (B.Sc)
9. Skills will come with experience
10. Communication skills and class management
11. Coping strategies
12. Participation in inset/workshops, etc
13. Intensive 1 year internship
14. Teaching styles/techniques
15. Academic qualifications matter if Teacher is motivated
16. Join/membership to a professional organisation
17. Read widely
18. Not much (up to the pupils)
19. Promote healthy teacher-pupil relationship
20. Career guidance
21. Positive influence
22. Negative influence
23. No influence
24. No influence, but how one teaches (positive influence)
25. Gender influence
26. Undecided as teacher's qualification and experience unknown to pupils
27. Qualification - No, Experience - Yes

B. RESOURCES

TEACHERS

28. No use made of other teachers
29. Makes use of other texts/references
30. Designs own worksheets
31. Uses facilities from other subject fields
32. Use laboratory facilities available
33. Use department practical manual
34. Uses/refers to other staff members
35. Exchange worksheets with other schools

36. Obsolete equipment
37. Star schools/media instruction
38. Laboratory - due to lack of resources
39. Due to shortage of time
40. Department curriculum packages
41. Teacher's own experience
42. Provide extra lessons
43. Exam papers (Model C) schools
44. As many appropriate resources as possible
45. Teacher exchange programme
46. Exposure to many problem situations - develop problem solving skills
47. Provide answers but no solutions
48. Providing access to information not easily available to pupils

PUPILS

49. Nothing special
50. Teacher style
51. Humour
52. Science fairs/exhibitions
53. Quizzes/crosswords
54. Books, worksheets and exam papers
55. Lost interest
56. No effect
57. A small positive influence
58. Broken equipment
59. Lack of practical work - too much theory
60. Shortage of textbooks
61. Did practical work like following a "recipe"
62. Developed group skills but no laboratory skills
63. Results were make believe
64. Made use of tutor
65. Tutor (+ve) influence
66. Tutor no influence
67. Did not make use of tutor
68. Attended revision programme
69. Helped other pupils / peer teaching
70. Theory only
71. Theory and practical demonstration
72. Theory, demonstration and pupil practical
73. Theory and pupil practical

C. LANGUAGE

74. No problems

- 75. Encountered problem - poor communication/understanding
- 76. Bridging programme
- 77. Helped
- 78. Abandoned
- 79. No special programme
- 80. "Study-Buddy" programme
- 81. Affected pupils progress
- 82. Teacher slowed down lesson

D. EXAMINATIONS

- 83. Had specimen paper / given to pupils
- 84. Did not have combined trial paper
- 85. Used specimen paper as assignment
- 86. Used specimen paper as trial exams
- 87. Combined trial paper discussed by tutor
- 88. Did not use specimen and combined trial papers
- 89. Received combined trial paper from teacher
- 90. Had no trial exams
- 91. Set own trial exam paper
- 92. Performed poorly
- 93. Performed better
- 94. Did not write trials
- 95. No shortage of textbooks
- 96. Shortage of textbooks - had to share
- 97. Text used to compile notes
- 98. Text used for application examples
- 99. Used "PHYSICHEM" extensively
- 100. Made "PHYSICHEM" available
- 101. Hardly used "PHYSICHEM"
- 102. Exposure to exam questions via worksheets
- 103. Teacher prepared notes for pupils
- 104. Compared contents of different texts
- 105. Used tutor's notes
- 106. Poor performance due to leakage/rescheduling of exams
- 107. Focused on rumours rather than study on own
- 108. Leakage/rescheduling disrupted study plan, flow of thought and frustrated pupils
- 109. Leaked papers too easily available
- 110. Marking was fair
- 111. From press reports - marking was a problem
- 112. Format had no effect
- 113. MCQ's were tricky - spent more time on it
- 114. Teacher had no faith in specimen paper
- 115. Paper was too long
- 116. Paper was timed correctly
- 117. Marking was too strict or unfair

- 118. Marking done by inexperienced markers
- 119. Exam stress led to depression
- 120. Rescheduling of papers gave me more time to prepare
- 121. Have a system of continuous assessment
- 122. Include a teacher component in pupil final assessment
- 123. Test Std 9 work externally at the end of Std 9 year
- 124. Have other moderated exams in Std 10
- 125. Should have a system of credits
- 126. Exams should be easier

E. DISRUPTIONS AT SCHOOL

- 127. Teacher never took leave
- 128. Teacher took study leave - work set aside
- 129. Syllabus was rushed
- 130. No revision done
- 131. Normal work continued
- 132. Pupil morale declined
- 133. Lost valuable time
- 134. Teacher member of APEK
- 135. Teacher member of SADTU
- 136. Low absenteeism (under 20 days)
- 137. High absenteeism (over 20 days)
- 138. Unexplained absence
- 139. Valid absence
- 140. Played truant
- 141. Worked while away
- 142. Did do revision

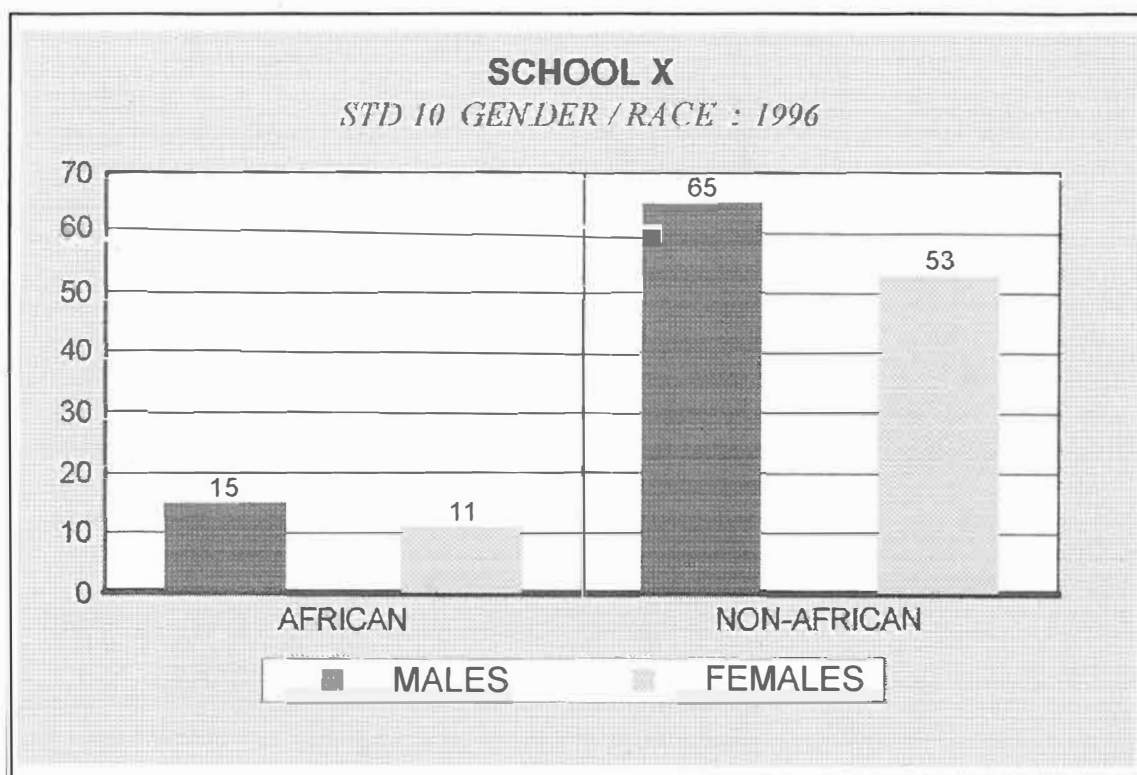
F. PARENTAL INVOLVEMENT

- 143. Had meeting before exams
- 144. Had no meeting after exams
- 145. Poor turnout of parents / did not attend
- 146. Parent/s satisfied with pupil performance
- 147. Parent/s dissatisfied with pupil performance
- 148. Had no meeting before exams
- 149. Met co-incidentally
- 150. Attended meeting, but did not meet teacher
- 151. Parents had faith and trust in pupil
- 152. Supported financially
- 153. Provided emotional support
- 154. Restricted TV viewing and socialising
- 155. Hardly any parental intervention
- 156. Parent involved in exam preparations, e.g. made video recordings

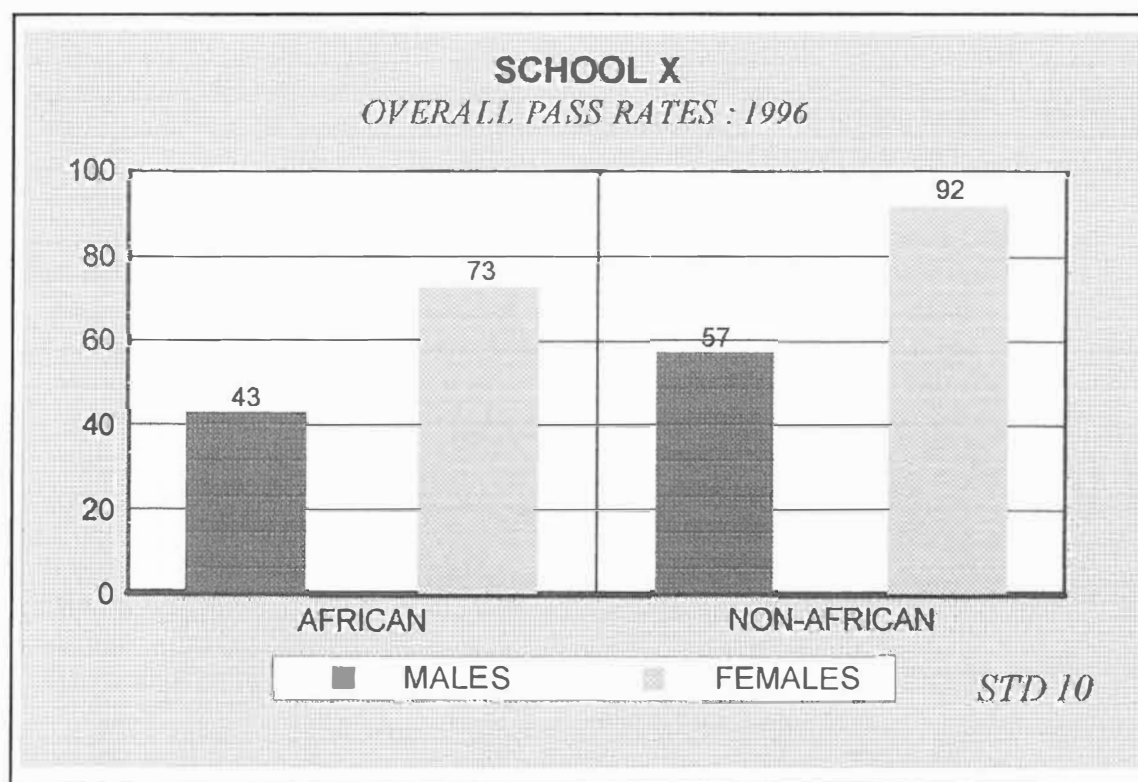
G. PUPIL PERFORMANCE

- 157. Attentive
- 158. Debates, argues, questions
- 159. Provides unusual solutions
- 160. Highly organised person
- 161. Generally quiet / never responds in class
- 162. Has difficulty grasping concepts
- 163. Has personal problems
- 164. Probably over-rated pupil
- 165. Interest in schoolwork declined
- 166. Put in last minute effort
- 167. Changed from SG to HG
- 168. Frequently absent
- 169. Highly motivated person
- 170. Nervous person
- 171. Pupil not capable of HG work
- 172. Paid more attention to other subject/s
- 173. Exposure to tutor helped a lot
- 174. Parental involvement
- 175. Took school work lightly
- 176. Good teaching
- 177. Biased towards Physics
- 178. Biased towards Chemistry
- 179. Pupil and teacher did not get on
- 180. Rescheduled papers
- 181. Rushed syllabus
- 182. Pure luck !
- 183. Developed a good problem solving strategy
- 184. Worked through plenty of exam papers
- 185. Peer learning
- 186. Poor teaching

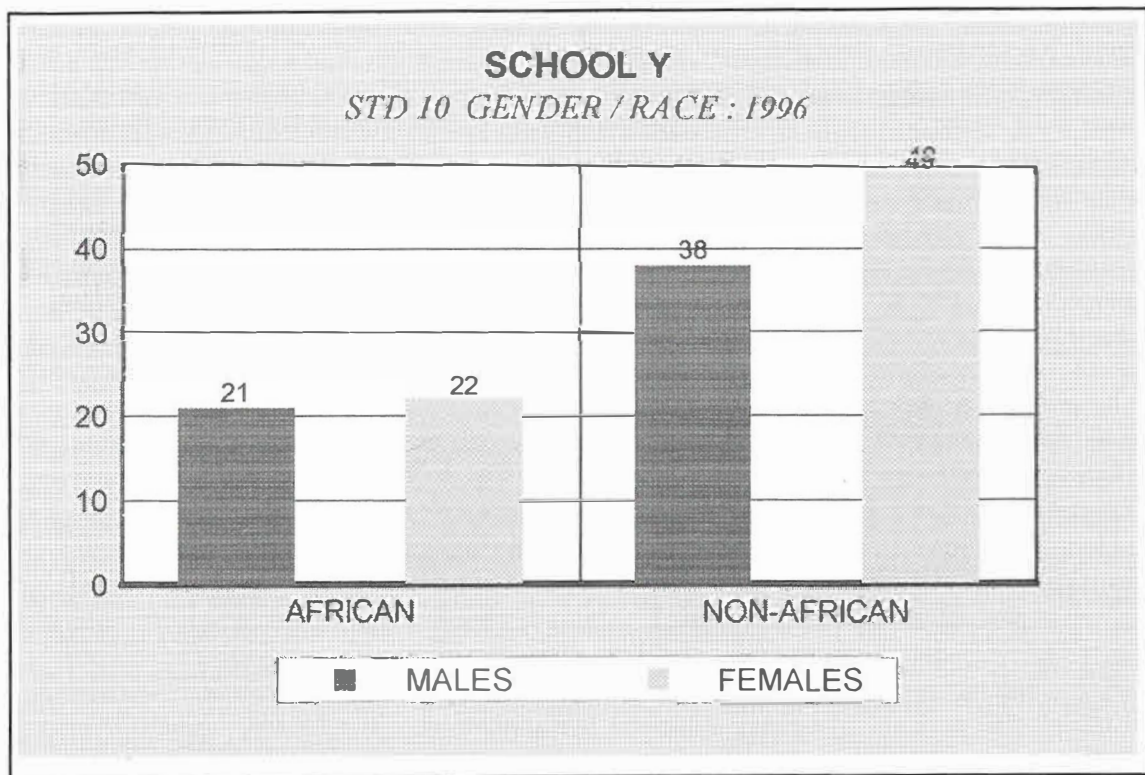
APPENDIX XIa



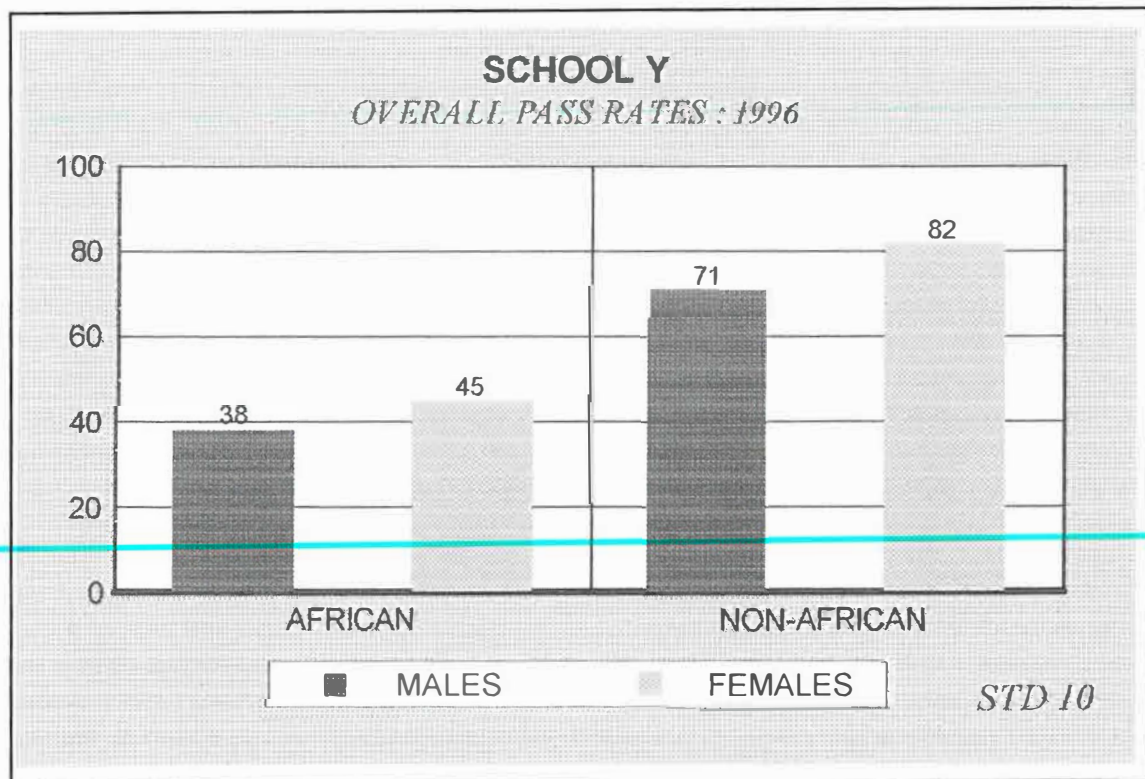
APPENDIX XIb



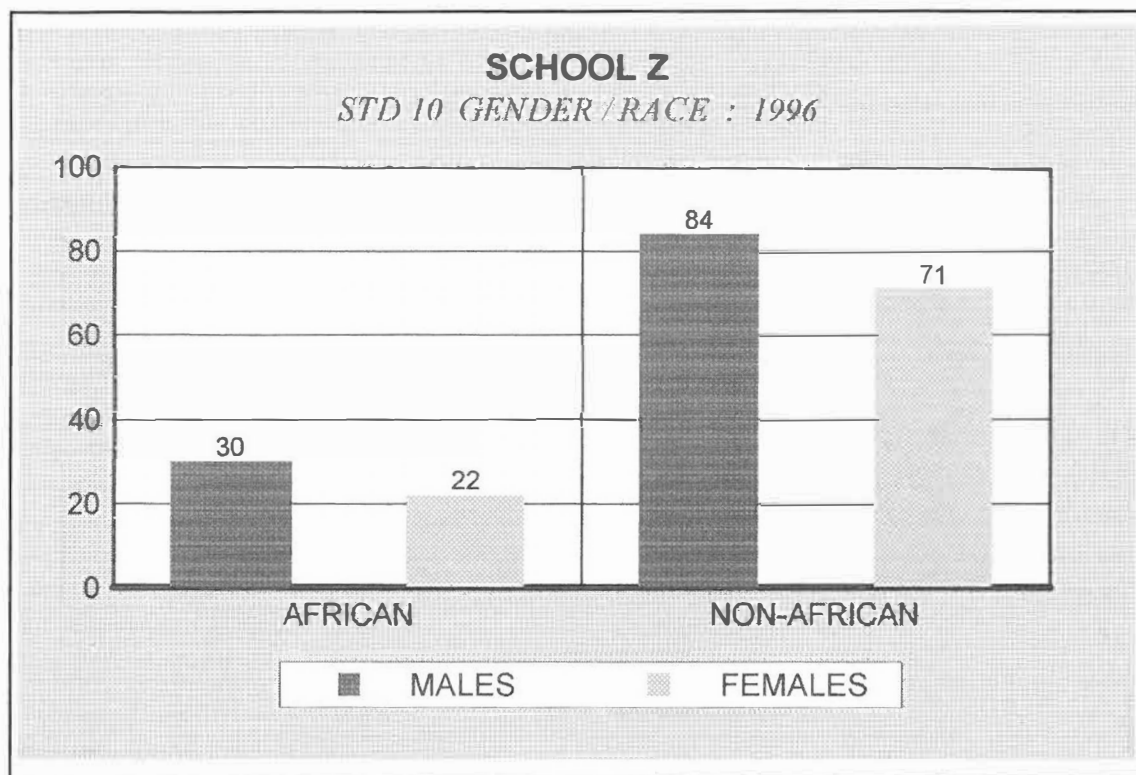
APPENDIX XIIa



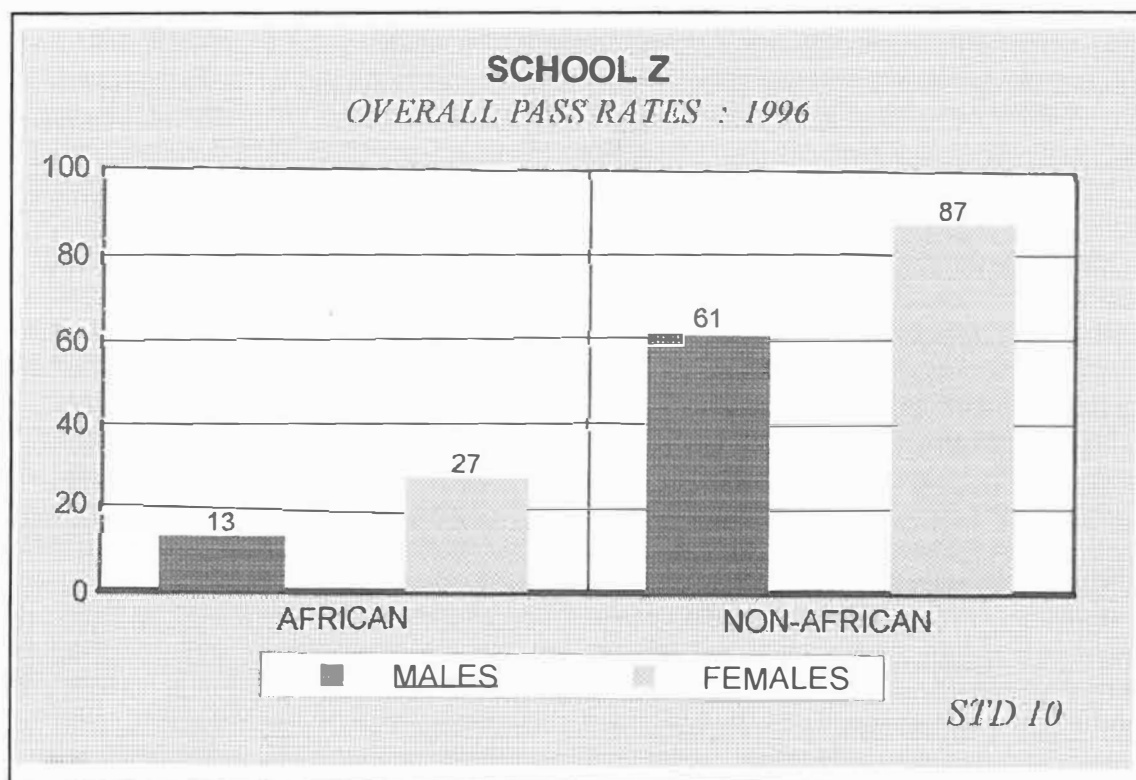
APPENDIX XIIb



APPENDIX XIIIa



APPENDIX XIIIb



APPENDIX XIV : PUPIL'S RESULTS

PUPIL DATA : SCHOOL X

PUPIL	RES.	CRSE	SUBJECTS / RESULTS									
			MATHS	PH.SC	BIO	C.ST	ACC	ART	TKE	SP.DR	GEOG	T.D
X1	ME	S11	C	C	C			A				
X2	ME	S7	B	B	C		B					
X3	ME	S17	E	D	E	C						
X4	SC	G090	F	E			F		E			
X5	FAIL	G090	GG	F			F		FF			
X6	FAIL	G090	GG	F			F		H			

PUPIL DATA : SCHOOL Y

PUPIL	RES.	CRSE	SUBJECTS / RESULTS									
			MATHS	PH.SC	BIO	C.ST	ACC	ART	TKE	SP.DR	GEOG	T.D
Y1	ME	S17	B	A	A	A						
Y2	ME	S7	E	D	B		D					
Y3	ME	S7	B	C	C		A					
Y4	ME	S7	E	D	D		D					
Y5	ME	S17	E	E	F	E						
Y6	ME	S17	GG	E	E	E						

PUPIL DATA : SCHOOL Z

PUPIL	RES.	CRSE	SUBJECTS / RESULTS									
			MATHS	PH.SC	BIO	C.ST	ACC	ART	TKE	SP.DR	GEOG	T.D
Z1	ME	S17	C	B	B	A						
Z2	ME	S7	C	B	A		B					
Z3	ME	S17	C	B	B	C				B		
Z4	FAIL	G019	H	H							F	F
Z5	FAIL	G019	H	H							E	F
Z6	FAIL	S2	H	H	H						H	

APPENDIX XV : PUPIL DATA

PUPIL	NO. OF DAYS ABSENT	STD 9 RESULTS	EXPECTED RESULTS	
			TEACHER'S	PUPIL'S
X1	19	68	C	B
X2	26	62	C	B
X3	35	56	D	C
X4	16	53	E	F
X5	54	45	F	F
X6	74	26	F	F
Y1	23	77	A	A
Y2	14	60	C	C
Y3	13	56	B	B
Y4	11	50	C	C
Y5	16	43	D	D
Y6	30	26	C	F
Z1	15	85	A	A
Z2	16	85	A	A
Z3	12	75	B	A
Z4	49	45	F	F
Z5	28	38	F	E
Z6	71	55	F	E

APPENDIX XVI : EXAMINED PRACTICAL WORK

QUESTIONS	X1	X2	X3	X4	X5	X6
a	73	72	73	73	73	73
b,c,d	71	71	71	71	71	71
e	70	70	70	70	70	70
f	73	73	73	73	73	73
	Y1	Y2	Y3	Y4	Y5	Y6
a	72	72	72	72	72	72
b,c,d	72	72	72	72	72	72
e	70	70	70	70	70	70
f	72	72	72	72	72	72
	Z1	Z2	Z3	Z4	Z5	Z6
a	70	70	70	70	70	70
b,c,d	72	71	71	71	71	71
e	70	70	70	70	70	70
f	70	70	70	70	70	70

Response required for the question :

How did you complete the following experiments ?

- a. test for chloride, sulphate and carbonate ions
- b. reducing action of H_2S
- c. precipitation reactions of H_2S
- d. test for H_2S
- e. phase equilibrium of water
- f. Ohm's law

APPENDIX XVII : SUB-EXAMINERS PERCEPTIONS

A. SUB-EXAMINER : PHYSICS (SEP)

1. Results were very poor.
2. Majority of students had problems with interpreting the questions and answering them correctly. Maybe due to a lack of experienced and qualified teachers; equipment; lack of preparation; concentrating only on leaked papers.
3. Poor use of calculators; poor manipulative skills; lack of interpretation of questions; writing answers not related to the question; insufficient preparation.
4. Answered Millikan's Expt. well and questions on Newton's Laws (gravitation).
5.
 - 5.1. not really due to unqualified teachers, but due to teachers being unaware of what is to be taught - eg. frictional forces were hardly taught to pupils, so pupils couldn't answer clearly.
 - 5.2. not due to inexperience
 - 5.3. neither
6. Electricity questions answered very poorly. Reflected that lack of exposure to practical equipment at school, pupils were unable to explain ratings of electrical appliances (like a bulb), also measurement of voltage and current.
7. Language barrier was a major issue. Pupils did not understand the English language. Since papers were printed in English and Afrikaans, it did not cater for the majority who were ESL pupils. Pupils wrote certain words in Zulu or another language if they couldn't find an English word.

8. Rescheduling, possibly. Some pupils had leaked papers which they were prepared for, therefore it could have affected their results.
9. Question papers were completed by the majority of students. There was no problem with timing.
10. Many instances of irregularities. eg. one boy answered 3 papers in 2 hours, for 2 others presumably absent. Referred to examiner. Matter handled by the relevant authority.
11. Restructuring : MCQ's too long, (15 too many), should have 10 but simpler or easier. Paper should be shortened, i.e. questions should be direct. Remove information that is irrelevant. This tends to mislead pupils. Language used must cater for ESL.
12. Suggestions : work through a whole lot of past papers; prepare well; should have 3 levels of papers Not all pupils can handle HG.

B. SUB-EXAMINER : CHEMISTRY (SEC)

1. Disastrous results. HG : about 40 - 50% scored between 0 - 20% for the entire paper, which meant that 40 - 50% failed. SG : 60% scored between 0 - 20%.
2. Leakages and probably the first common examination. Pupils did not know what to expect, although specimen papers were sent to pupils, they were not a true reflection as it was merely chunks extracted from past papers. The final paper was more descriptive.
3. Pupils could not apply their knowledge and could not give scientific explanations. The exam paper instructions were not clear. The ESL learner was not catered for (and they formed the major slice of the pupil population).

4. No real strength; the good pupils did well throughout and applied their knowledge well.
5.
 - 5.1. couldn't really tell from results
 - 5.2. same as 5.1.
 - 5.3. neither

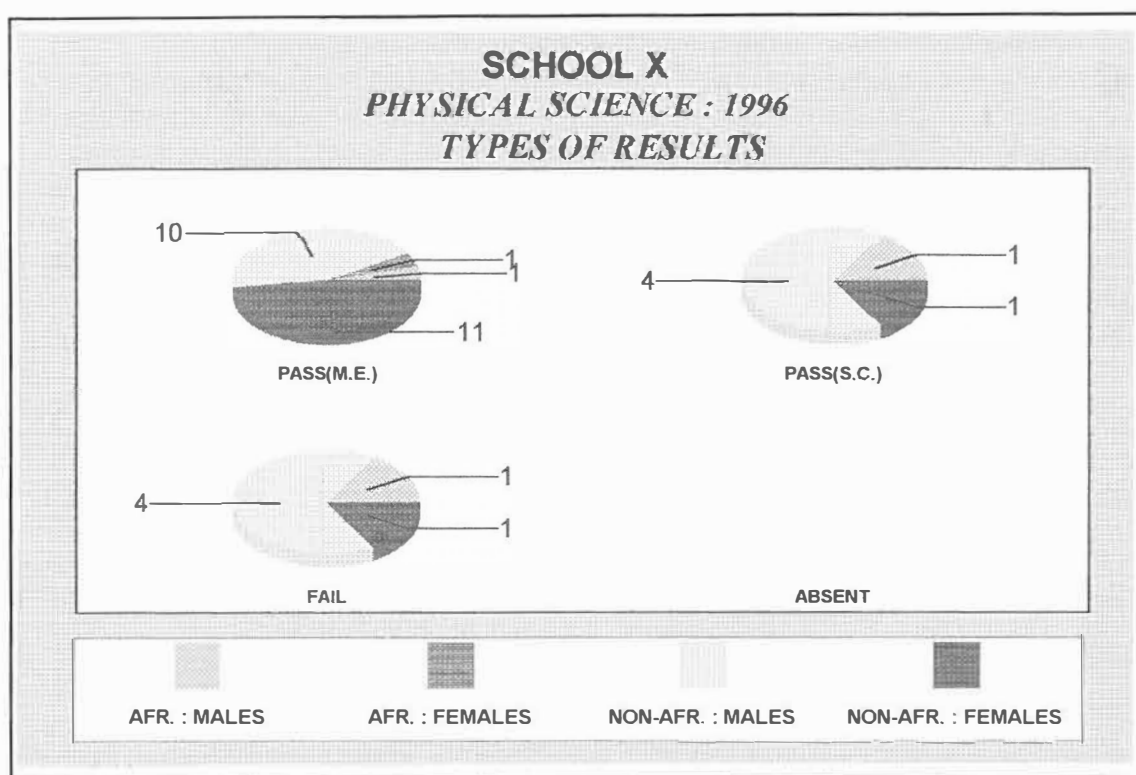
However, Black teachers who marked, stated that they did not know some content well, so they could not put it across to pupils.
6. Although many disadvantaged schools may have not done practicals, they were able to explain results from textbook or learnt knowledge.
7. Pupils had problems expressing themselves in a clear manner.
8. Rescheduling seemed to have affected the pupils in terms of preparation and it also impacted psychologically.
9. Majority of pupils completed the paper. No problems with timing.
10. There were many instances of irregularities - in some cases, restricted to particular schools. This was brought to the examiners attention and handled by the relevant authorities.
11. Restructuring : need to cater for ESL learners; simplify language; use diagrams that pupils are familiar with; instructions should be clear.
12. Suggestions : work through as many past papers as possible; read, draw and extract relevant information; apply your knowledge all the time.

C. EXAMINER (EXM)

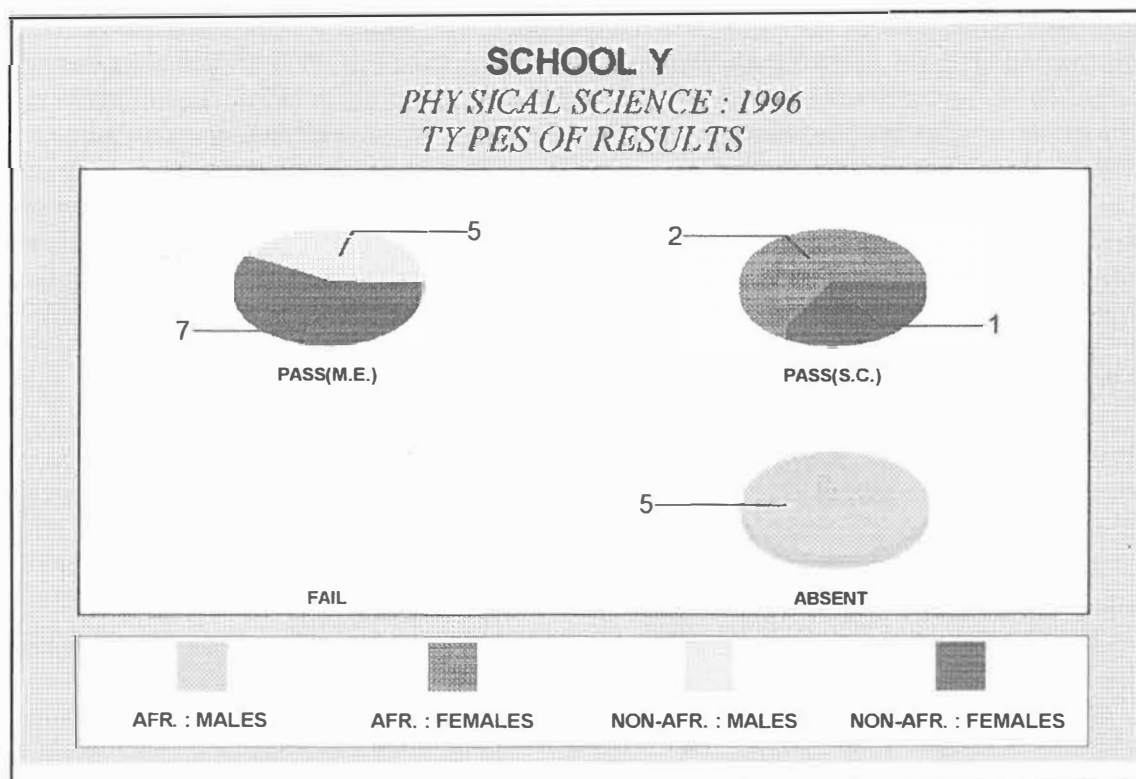
1. Really poor, based on raw scores. Phenomenal increase in G symbols. Reflective of the joining of the different Education Departments. It was largely pupils that came from disadvantaged schools, that did poorly. Schools are not totally integrated.
2. I wonder if Physics is being taught properly in schools? Pupils are unable to provide definitions. This supposed to be giving away marks, but pupils don't seem to want to take them. I don't think that for the HG paper, the level of preparation by the teachers and pupils is pitched correctly. I don't think people are looking at the right sort of questions when preparing pupils. My suspicion is that especially in the outlying rural areas, they don't have that many resources, like past year papers. The other factor is that a large number of pupils did HG. Maybe it is a cultural thing. Grade choice is incorrect. This could also be due to poor resources.
3. Poor definitions and laws; poor mathematical manipulation (changing subject of a formula); focusing on calculations only and not on conceptual understanding; poor language expression.
4. Level 2 calculations.
5.
 - 5.1. could be
 - 5.2. could be
 - 5.3. could beTeacher unrest led to disruptions of schools. What the teacher does in the classroom is more important.
6. Reflected lack of textbooks; past year papers(Physichems); poor teaching.

7. Did consider language while setting, but not sure whether the right balance was reached. Pupils responded with poor expressions.
8. Rescheduling would have had psychological impact on pupils. As an examiner, I was disappointed, because a lot of thought was put into setting the original paper. Now that a new paper was required, in a short space of time, originality became a problem. Paper was balanced with the original.
9. Many pupils did not complete. They were leaving a lot of blanks. Examiner was worried about 15 MCQ's, felt it was time consuming.
10. Many irregularities. There was blatant copying in schools.
11. Restructuring : probably reduce MCQ's to 10 only; relook at total marks for paper; practical work restricted - feels that this should be tested or moderated, as the work is not being done.
12. Suggestions : work through basic exercises; apply exam problems; improve conceptual understanding, especially in electricity; question everything.

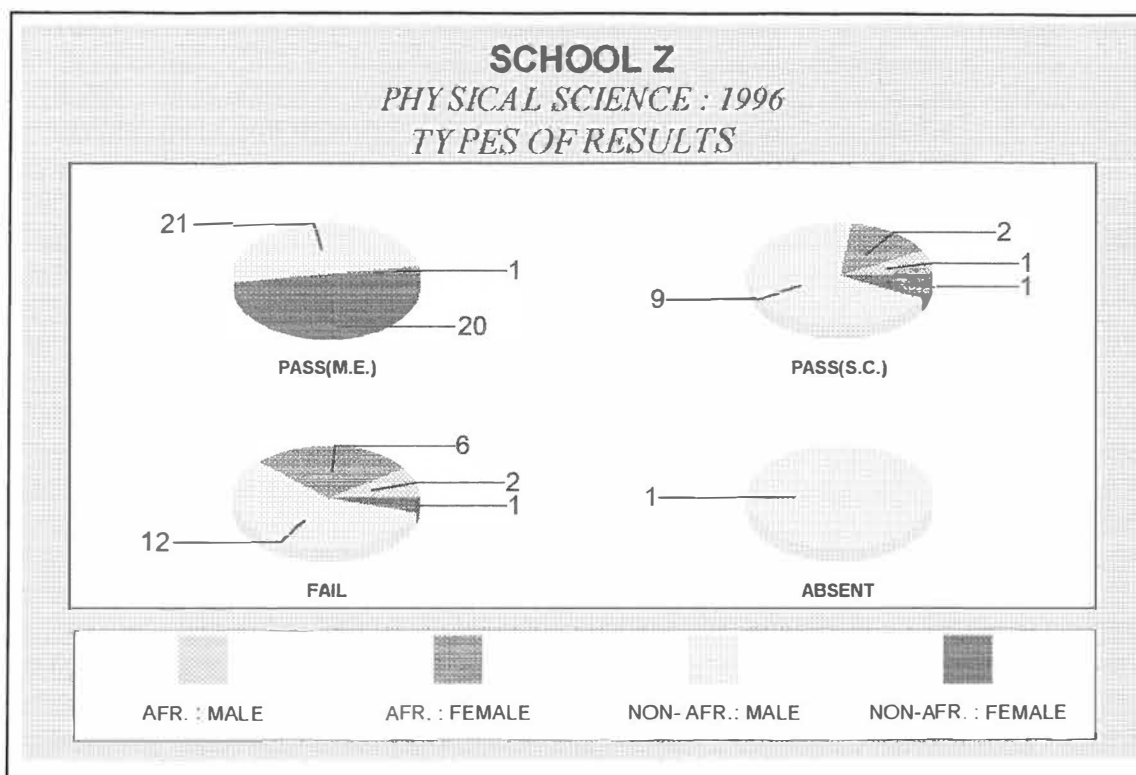
APPENDIX XVIIIa : RESULTS - SCHOOL X (Phy. Sc. pupils)



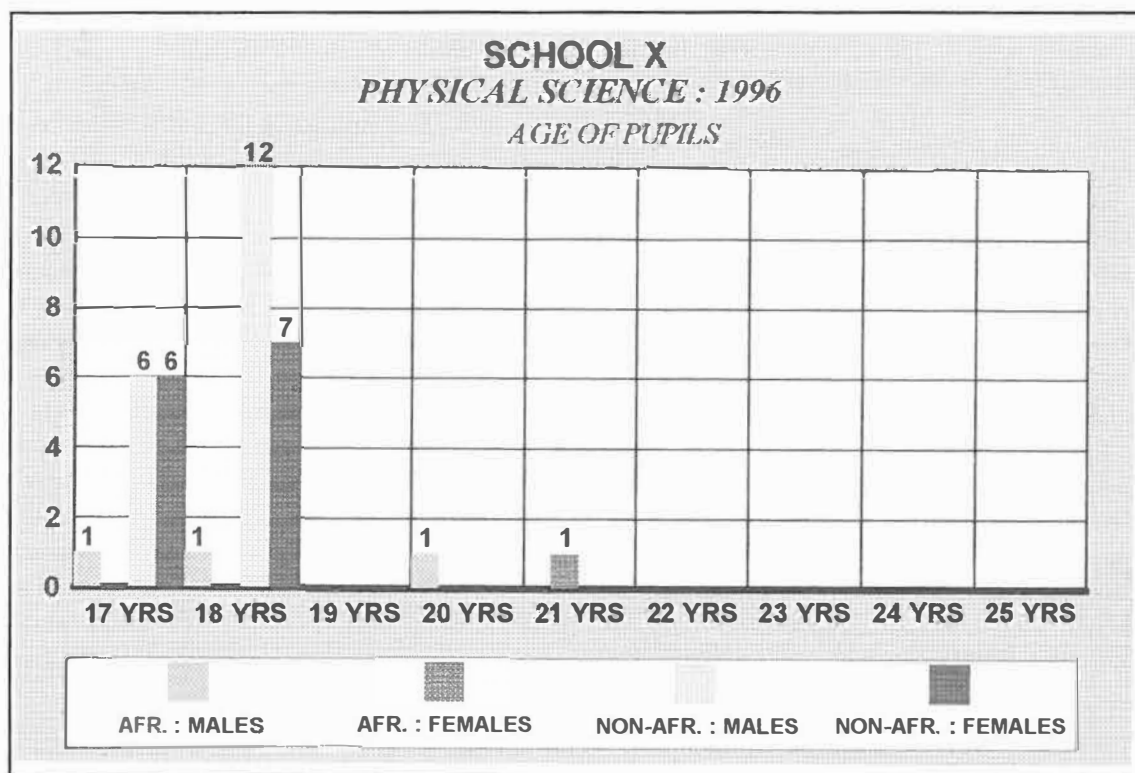
APPENDIX XVIIIb : RESULTS - SCHOOL Y (Phy. Sc. pupils)



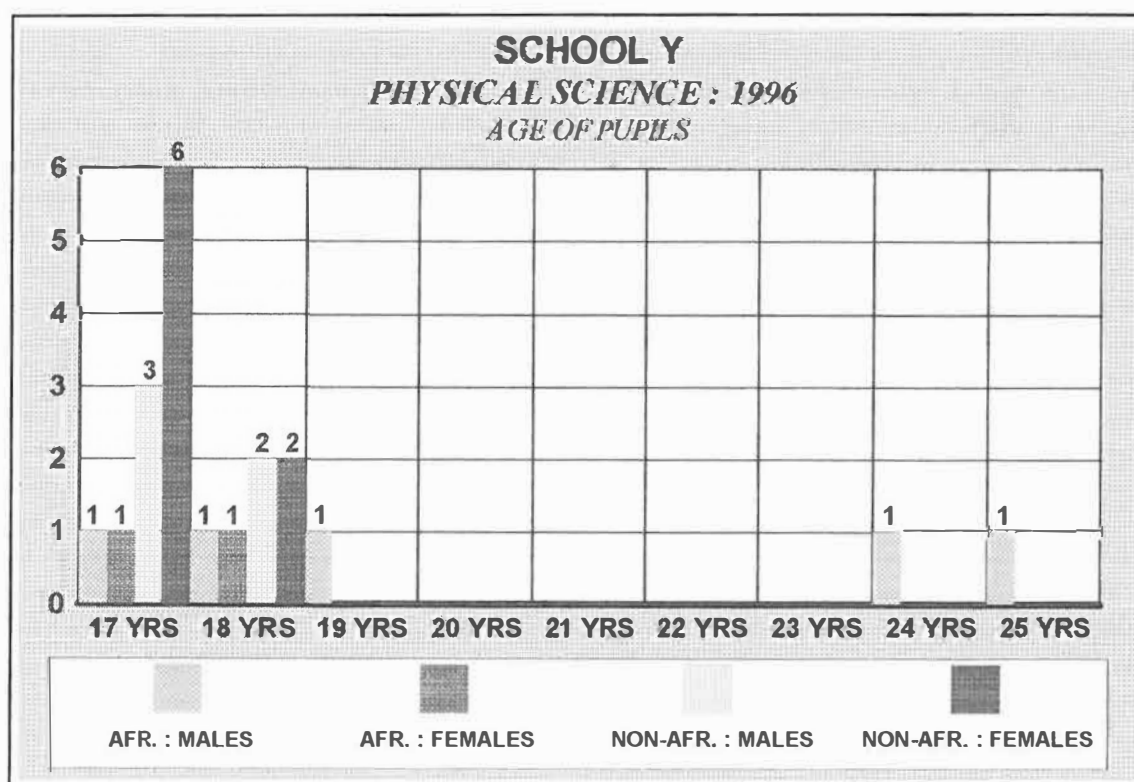
APPENDIX XVIIIc : RESULTS - SCHOOL Z (Phy. Sc. pupils)



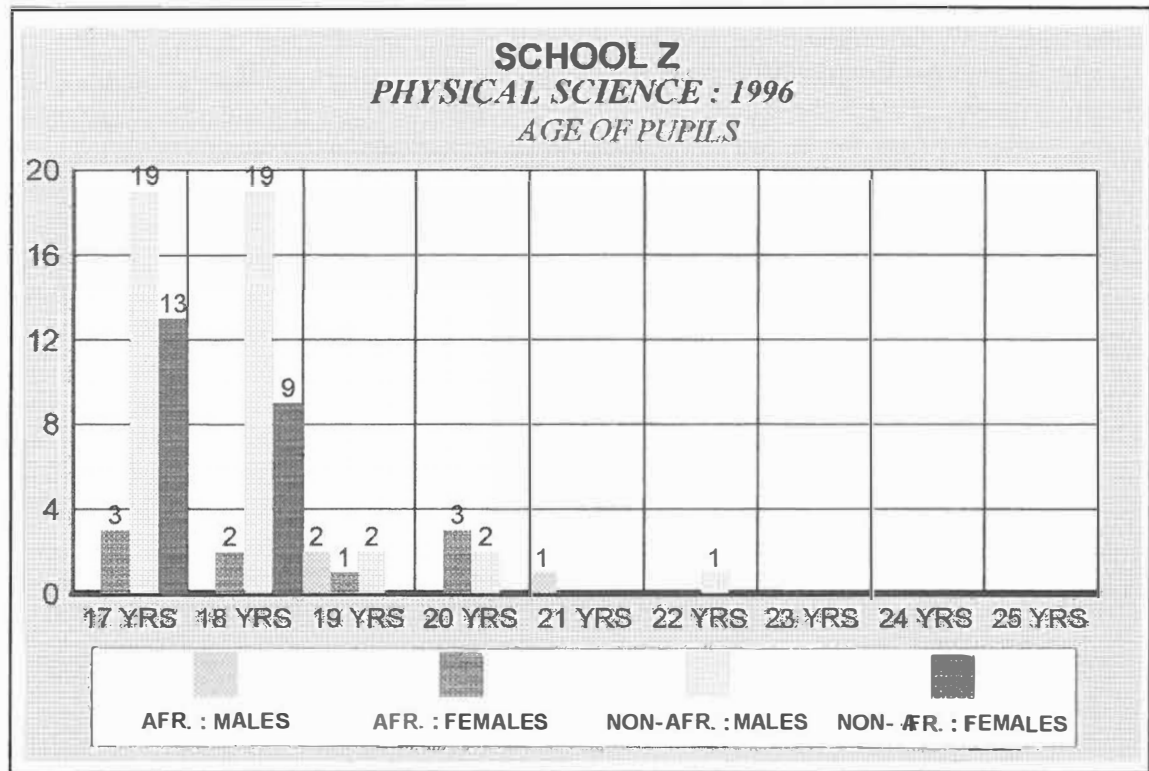
APPENDIX XIXa : SCHOOL X - AGE OF PUPILS



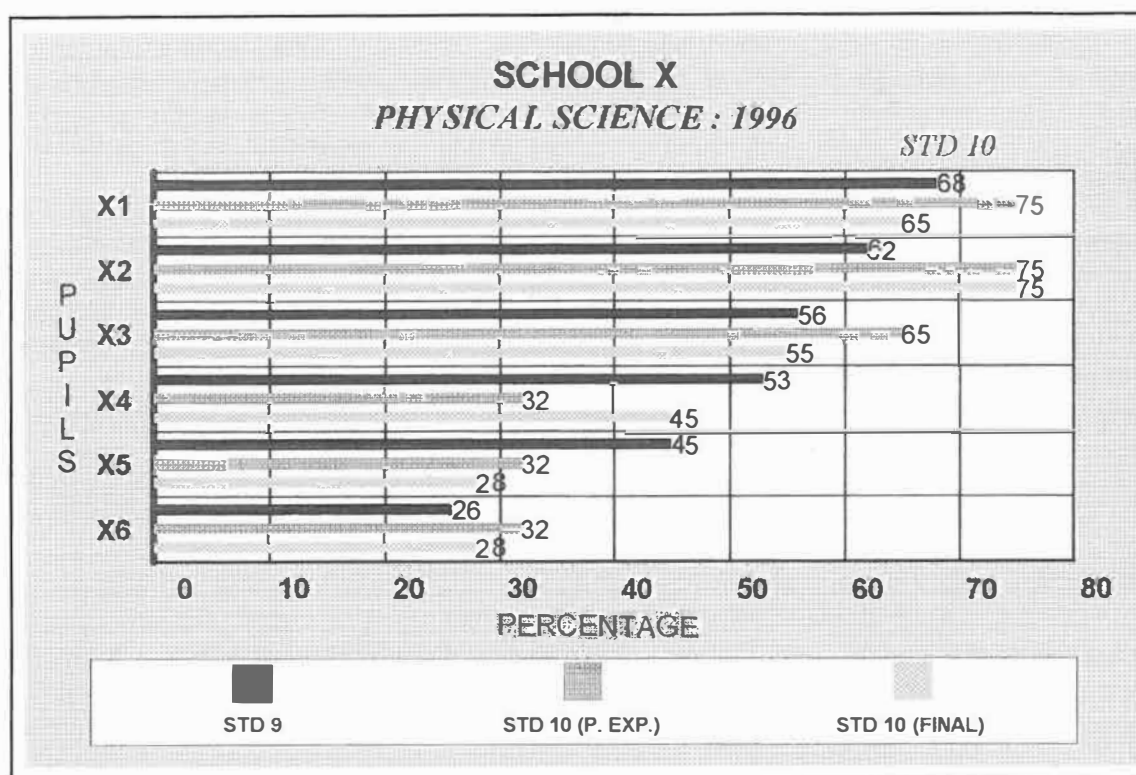
APPENDIX XIXb : SCHOOL Y - AGE OF PUPILS



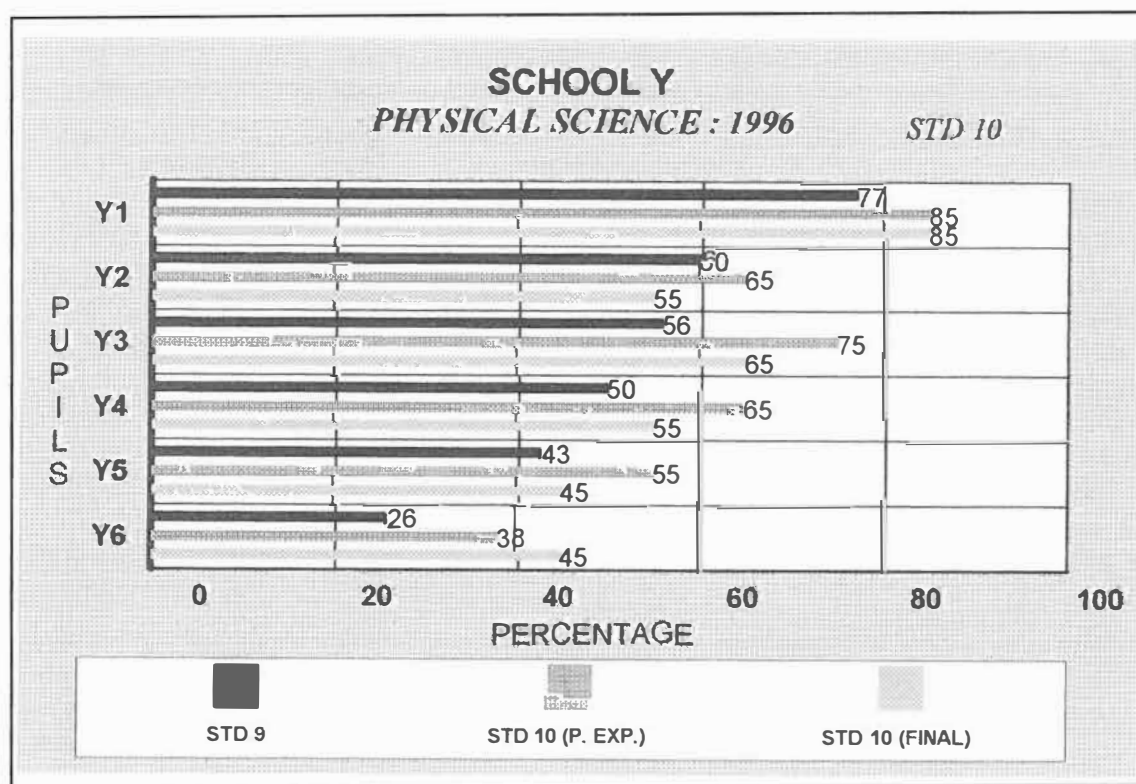
APPENDIX XIXc : SCHOOL Z - AGE OF PUPILS



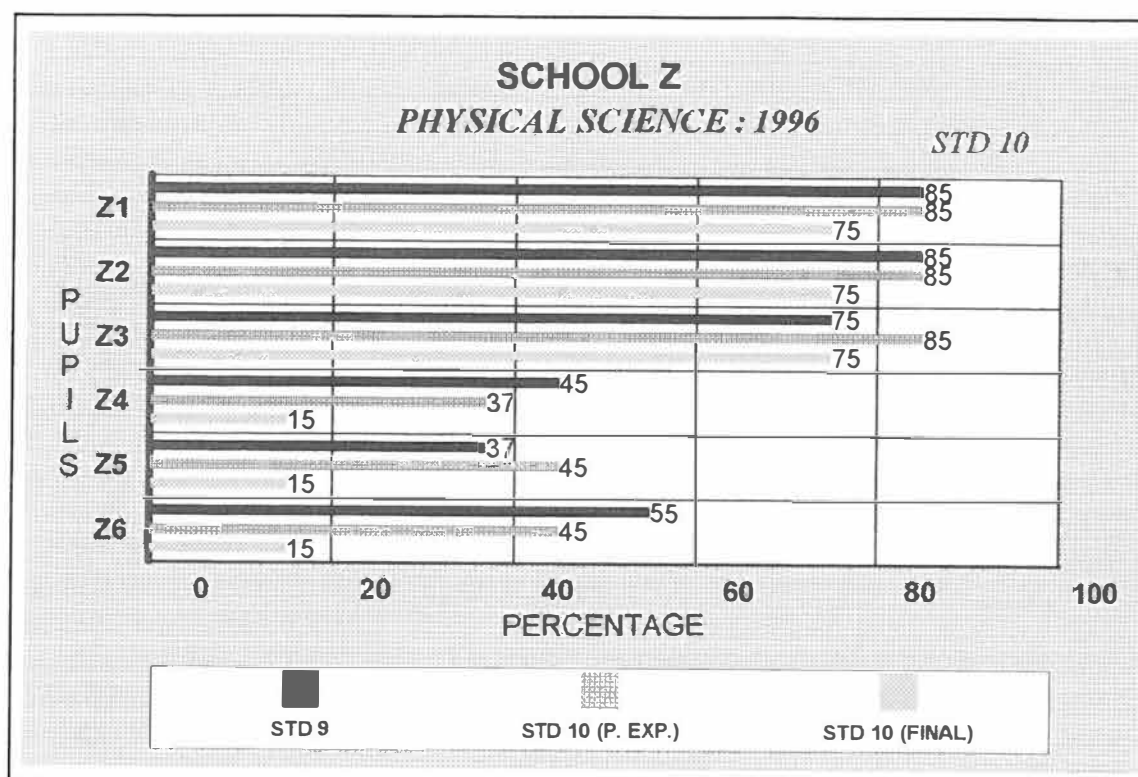
APPENDIX XXa : SCHOOL X - PUPIL'S EXPECTATIONS



APPENDIX XXb : SCHOOL Y - PUPIL'S EXPECTATIONS



APPENDIX XXc : SCHOOL Z - PUPIL'S EXPECTATIONS



APPENDIX XXI : GLOSSARY (ACRONYMS & ABBREVIATIONS)

ANC	African National Congress
APEK	Association of Professional Educators of Kwa-Zulu Natal
AR	abstract random
AS	abstract sequential
AS & TS	Associated Scientific & Technical Societies
ASTE	African Science and Technology Education
CA	continuous assessment
CR	concrete random
CS	concrete sequential
DET	Department of Education and Training
ESL	English second language
EXM	examiner
FRD	Foundation for Research and Development
GNU	Government of National Unity
GPM	Government Performance Monitor
HG	Higher Grade
HIT	how I teach
HOD	House of Delegates
IFP	Inkatha Freedom Party
INSET	In-service in Education and Training
IQ	Intelligence Quotient
KASTE	Kwa-Zulu Natal Association of Science and Technology Educators
KZN	Kwa-Zulu Natal
LG	Lower Grade
MCQ	multiple choice question
ME	matriculation with exemption
MEC	Member of the Executive Council
MLSTC	M.L. Sultan Technical College
NED	Natal Education Department
NP	National Party
OBE	outcomes-based education
PRESET	Pre-service in Education and Training
RDP	Reconstruction and Development Programme
SADTU	South African Democratic Teachers Union
SAFCERT	South African Certification Council
SC	matriculation without exemption (senior certificate)
SEC	sub-examiner for chemistry
SEP	sub-examiner for physics
SES	socio-economic status
SET	Science, Engineering and Technology
SG	Standard Grade
UDW	University of Durban-Westville
UND	University of Natal (Durban)
UNISA	University of South Africa
USA	United States of America
VSP	voluntary severance package
WITS	University of Witwatersrand